SCIENCE

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CONTENTS:

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*THE JOHNS HOPKINS UNIVERSITY COMMEMORATIVE ADDRESS.**

THIS is not the time, although it is a birthday, to review the infancy of this University. Reminiscences of the cradle and the nursery are profoundly interesting to a very small number of the near and dear, but according to a formula, which may be stated with mathematical precision, the interest varies inversely as the square of the distance.

It is meet and right and our bounden duty to commemorate the munificence of the founder, who in his grove at Clifton, and at his residence in town, spent the close of his life in perfecting a plan by which his fortune might be made to benefit humanity. Two noble purposes, the education of youth and the relief of suffering, —the Johns Hopkins University and the Johns Hopkins Hospital, became the objects of his thought and bounty. It would be pleasant to dwell upon the personalities of his early advisers,—three of whom may now witness our fervent congratulations. We might journey with them to Cambridge, New Haven, Ithaca, Ann Arbor, and Charlottesville, as they engaged in enquiries respecting the nature and offices of those leading universities, an example of

* By Daniel C. Gilman, President of the Johns Hopkins University from 1875 to 1901, on the occasion of the celebration of the twenty-fifth anniversary of the founding of the university.

original research, praiseworthy and beneficial. We might sit with them in a little room on North Charles Street, and listen to Presidents Eliot, Angell, and White as they were subjected to 'interviews,' recorded by the swift strokes of the stenographic pen, and now preserved in our archives. We might wonder by what process the Trustees selected a president, and be willing to learn what he said to them in his earliest conversation. It would gratify some curiosity to review the correspondence carried on with those who afterward became members of the faculty,—and with those who did not. It would be an extraordinary pleasure to the speaker on this occasion, to awaken the memories of those early days of unbounded enthusiasm and unfettered ideality, well described in a periodical by one who was here at the outset,—days which surprised and delighted intelligent observers.

These temptations must be avoided. The occasion is too important, the audience too varied, the visitors too many and too distinguished, to warrant the employment of this brief hour in personal reminiscences and local congratulations. We are rather bound to consider some of the grave problems of education which have engaged, during a quarter of a century, the study of able and learned men, and have led to the development, in this country, of the idea of the University. This period has seen marvellous improvements in higher education, and although, in the history of intellectual development, the nineteenth century may not be as significant as the thirteenth, when modern universities came into being at Bologna, Paris, and Oxford, yet we have lived at a time when forces have been set to work of the highest significance. Libraries, seminaries and laboratories have been enlarged and established in every part of the land.

Let us go back to the year 1876, that year of jubilee, when the centennial celebration in Philadelphia brought together, in open concord, states and peoples separated by dissension and war. Representatives from every part of the land assembled, in the City of Brotherly Love, to commemorate the growth of a century. The triumph of liberal and industrial arts, the progress of architecture, sculpture, and painting, were interpreted by the music of our Sidney Lanier. The year was certainly propitious. So was the place. Maryland was a central state, and Baltimore a midway station between the North and the South. The people had been divided by the war, but there were no battle fields in our neighborhood to keep in mind the strife of brethren. The State of Maryland had been devoted to the idea of higher education ever since an enthusiast in the earliest colonial days projected the establishment of a university on an island in the Susquehanna. Liberal charters had been granted to colleges, of which St. John's, the successor of the first free school, must have honorable mention, a college likely to be increasingly useful during the twentieth century. The University of Maryland, with scanty resources, encouraged professional training in law, medicine, and the liberal arts (nominally also, in theology), but its efforts were restricted by the lack of funds. Nathan R. Smith, David Hoffman and other men of eminence were in the faculty. The Catholic Church had established within the borders of the state a large number of important schools of learning. One of them, St. Mary's College, under the cultivated fathers of St. Sulpice, had been the training place of some of the original promoters of the Johns Hopkins University. Yet there was nothing within the region between Philadelphia and Charlottesville, between the Chesapeake and the Ohio, which embodied, in 1876, the idea of a true university. Thus it appears that

the time, the place and the circumstances, were favorable to an endowment which seemed to be extraordinarily large, for the munificence of Rockefeller, Stanford and Carnegie could not be foreseen.

The founder made no effort to unfold a plan. He simply used one word,—UNIVERSITY,—and he left it to his successors to declare its meaning in the light of the past, in the hope of the future. There is no indication that he was interested in one branch of knowledge more than in another. He had no educational 'fad.' There is no evidence that he had read the writings of Cardinal Newman or of Mark Pattison, and none that the great parliamentary reports had come under his eye. He was a large minded man, who knew that the success of the foundation would depend upon the wisdom of those to whom its development was entrusted; and the Trustees were large minded men who knew that their efforts must be guided by the learning, the experience, and the devotion of the Faculty. There was a natural desire, in this locality, that the principal positions should be filled by men with whom the community was acquainted, but the Trustees were not governed by an aspiration so provincial. They sought the best men that could be found, without regard to the places where they were born, or the colleges where they had been educated. So, on Washington's birthday, in 1876, after words of benediction from the President of Harvard University, our early counsellor and our constant friend, the plans of this University were publicly announced in the President's inaugural speech.

As I cast my thoughts backward, memories of the good and great who have been members of our society rise vividly before us,—benefactors who have aided us by generous gifts, in emergencies and in prosperity; faithful guardians of the trust; illustrious teachers; and brilliant scholars who have proceeded to posts of usefulness and honor, now and then in Japan, in India, in Canada, but most of them in our own land, from Harvard to the Golden Gate.

I must not linger, but lead you on to broader themes. May I venture to assume that we are an assembly of idealists. As such I speak; as such you listen. We are also practical men. As such, we apply ourselves to useful purposes, and to our actions we apply the test of common sense. Are our aims high enough? are they too high? are our methods justified by experience? are they approved by the judgment of our peers? can we see any results from the labors of five and twenty years? can we justify a vigorous appeal for enlargement? These and kindred questions press themselves for consideration on this memorial day. But in trying to answer them, let us never lose sight of the ideal,—let us care infinitely more for the future than we do for the past. Let us compare our work with what is done elsewhere and with what might be done in Baltimore. In place of pride and satisfaction, or of regret that our plans have been impeded, let us rejoice that the prospects are so encouraging, that the opportunities of yesterday will be surpassed to-morrow.

If it be true that 'the uses of Adversity' are sweet,—Adversity that 'wears yet a precious jewel in his head,' let us look forward to leaving our restricted site for a permanent home where our academic life will be 'exempt from public haunt,' where we shall 'find tongues in trees, books in the running brooks, sermons in stones, and good in every thing.' In faith and hope and gratitude, I have a vision of Homewood, where one person and another will build the structures of which we stand in so much need,—where scholarship will have its quiet retreat, where experimental science will be removed from the jar of the city street, where health and vigor will be

promoted by athletic sports in the groves of Academus. The promised land which Moses sees from Pisgah, our Joshua will possess.

Some curious parallels, familiar to the readers of history, may here be brought to mind. Thrice, in three centuries, great universities have arisen with their healing influence at the close of long wars. In familiar language, Motley tells us how the university of Leyden was established by the Dutch Republic, after the fearful siege which that brave city had endured. On the 5th of February, 1575, three hundred years before our natal day, the city of Leyden crowned itself with flowers, and 'with harmless pedantry, interposed between the acts of the longest and dreariest tragedy of modern times,' celebrated the new foundation. Allegorical figures moving in procession escorted the orator of the day, the newly appointed professors and other dignitaries, to the cloister of Saint Barbara where with speech and banquet they celebrated the day. Ever since, Leyden has been a noble seat of learning, and many of our own countrymen in early days resorted to it. The university of Berlin was established after the humiliation of Prussia by the Napoleonic wars. William von Humboldt has many titles to fame,—but none of his laurels are so fresh as the wreaths which crown his brow as the founder of that great university to which so many of the foremost scholars of Europe have been called, from F. A. Wolf to Van't Hoff. Within the memory of most of us, the university of Strasburg sprang into life at the close of the Franco-Prussian war. The German Emperor could see no better way of giving peace and prosperity to the captured province, than by making it the seat of a great university.

At the close of our civil war came the opportunity of Baltimore. It led to an extraordinary and undesigned fulfilment of an aspiration of George Washington. As his exact language is not often quoted, I venture to give it here. In his last will and testament, after expressing his ardent desire that local attachments and State prejudices should disappear, he uses the following words.

"Looking anxiously forward to the accomplishment of so desirable an object as this is (in my estimation), my mind has not been able to contemplate any plan more likely to effect the measure, than the establishment of a University *in a central part of the United States*, to which the youths of fortune and talents from all parts thereof may be sent for the completion of their education, in all the branches of polite literature, in arts and sciences, in acquiring knowledge in the principles of politics and good government, and, as a matter of infinite importance in my judgment, by associating with each other, and forming friendships in juvenile years, be enabled to free themselves in a proper degree from those local prejudices and habitual jealousies which have just been mentioned, and which, when carried to excess, are never-failing sources of disquietude to the public mind, and pregnant of mischievous consequences to this country."

You will please to notice that he did not speak of a university in Washington, but of a university 'in the central part of the United States.' What is now the central part of the United States? Is it Chicago or is it Baltimore?

Let me now proceed to indicate the conditions which existed in this country when our work was projected. You will see that extraordinary advances have been made. The munificent endowments of Mr. John D. Rockefeller and of Mr. and Mrs. Leland Stanford,—the splendid generosity of the State legislatures in Michigan, Wisconsin, Minnesota, California, and other Western States, the enlarged resources of Harvard, Yale, Columbia, Princeton, Pennsylvania and other well established universities, and now the unique and unsurpassed generosity of Mr. Carnegie have entirely changed the aspects of liberal education and of scientific investigation.

As religion, the relation of finite man to the Infinite, is the most important of all human concerns, I begin by a brief reference to the attitude of universities toward Faith and Knowledge. The earliest universities of Europe were either founded by the Church or by the State. Whatever their origin, they were under the control, to a large extent, of ecclesiastical authorities. These traditions came to our country, and the original colleges were founded by learned and Godly men, most of them, if not all, the ministers of the gospel. Later, came the State universities and later still, the private foundations like that in which we are concerned. Gradually, among the Protestants, laymen have come to hold the chief positions of authority formerly held by the clergy. The official control, however, is less interesting at this moment than the attitude of universities toward the advancement of knowledge. To-day, happily, apprehensions are not felt, to any great extent, respecting the advancement of science. It is more and more clearly seen that the interpretation of the laws by which the universe is governed extending from the invisible rays of the celestial world to the most minute manifestations of organic life reveal one plan, one purpose, one supreme sovereignty—far transcending the highest conceptions to which the human mind can attain respecting this sovereign and infinite Power. Sectarian supremacy and theological differences have dwindled therefore to insignificance, in institutions where the supreme desire is to understand the world in which we are placed, and to develop the ablest intellects of each generation, subservient to the primeval injunction 'replenish the earth and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth.' Notwithstanding these words, the new Biology, that is the study of living creatures, encountered peculiar prejudices and opposition. It was the old story over again. Geology, early in the century, had been violently attacked; astronomy, in previous centuries, met its bitter opponents; higher criticism is now dreaded. Yet quickly and patiently the investigator has prosecuted and will continue his search for the truth,—heedless of consequences, assured by the Master's words,—'the Truth shall make you free.'

Still the work goes on. Science is recognized as the handmaid of religion. Evolution is regarded by many theologians as confirming the strictest doctrines of predestination. The propositions which were so objectionable thirty years ago are now received with as little alarm as the propositions of Euclid. There are mathematicians who do not regard the Euclidean geometry as the best mode of presenting certain mathematical truths, and there are also naturalists who will not accept the doctrines of Darwin, without limitation or modification, but nobody thinks of fighting over the utterances of either of these philosophers. In fact, I think it one of the most encouraging signs of our times that devout men, devoted to scientific study, see no conflict between their religious faith and their scientific knowledge. Is it not true that as the realm of Knowledge extends the region of Faith though restricted remains? Is it not true that Science to-day is as far from demonstrating certain great propositions, which in the depths of our souls we all believe, as it was in the days of the Greek philosophers? This university, at the outset, assumed the position of a fearless and determined investigator of nature. It carried on its work with quiet, reverent, and unobtrusive recognition of the immanence of divine power,—of the Majesty, Dominion, and Might, known to men by many names, revered by us in the words that we learned from our mothers'

lips, Almighty God, the Father everlasting.

Another danger, thirty years ago, was that of conflict between the advocates of classical and scientific study. For many centuries Greek and Latin were supreme in the faculty of liberal arts, enforced and strengthened by metaphysics and mathematics. During the last half century, physical and natural sciences have claimed an equal rank. The promotion has not been yielded without a struggle, but it is pleasant to remember that in this place, no conflict has arisen. Among us, one degree, that of Bachelor of Arts, is given alike to the students of the Humanities and the students of Nature and the degree of Doctor of Philosophy may be won by advanced work in the most remote languages of the past or in the most recent developments of biology and physics. Two illustrious teachers were the oldest members of the original faculty;—one of them universally recognized as among the foremost geometricians of the world,—the other, renowned for his acquaintance with the masters of thought in many tongues, and especially for his appreciation of the writers of ancient Greece, upon whose example all modern literature is based.

Our fathers spoke of 'Church and State,' and we but repeat their ideas when we say that universities are the promoters of pure religion and wise government. This university has not been identified with political partisanship,—though, its members, like all patriots, have held and expressed their opinions upon current questions, local and national. Never have the political views of any teacher helped or hindered his preferment; nor have I any idea what would be the result of the party classification of our staff. This, however, may be claimed. The study of politics, in the sense of Freeman, 'History is past politics, and politics present history,' has been diligently promoted. The principles of Roman law, international arbitration, jurisprudence, economics, and institutional history have here been set forth and inculcated,—so that in every part of the land, we can point to our graduates as the wise interpreters of political history, the strong promoters of democratic institutions, the firm believers in the merit system of appointments, and in local self-government.

A phrase which has lately been in vogue is original research. Like all other new terms, it is often misapplied, often misunderstood. It may be the highest occupation of the human mind. It may be the most insignificant. A few words may therefore be requisite to explain our acceptance of this word. When this university began, it was a common complaint, still uttered in many places, that the ablest teachers were absorbed in routine and were forced to spend their strength in the discipline of tyros, so that they had no time for carrying forward their studies or for adding to human knowledge. Here the position was taken at the outset that the chief professors should have ample time to carry on the higher work for which they had shown themselves qualified, and also that younger men, as they have evidence of uncommon qualities, should likewise be encouraged to devote themselves to study. Even those who were candidates for degrees were taught what was meant by profitable investigation. They were shown how to discover the limits of the known; how to extend, even by minute accretions, the realm of knowledge; how to cooperate with other men in the prosecution of enquiry; and how to record in exact language, and on the printed page, the results attained. Investigation has thus been among us the duty of every leading professor, and he has been the guide and inspirer of fellows and pupils, whose work

may not bear his name, but whose results are truly products of the inspiration and guidance which he has truly bestowed.

The complaint was often heard, in the early seventies, that no provision was made in this country for post-graduate work except in the three professional schools. Accordingly, a system of fellowships, of scholarships, and of other provisions for advanced study was established here, so well adapted to the wants of the country at that time that its provisions have been widely copied in other places. It now seems as if there was danger of rivalry in the solicitation of students, which is certainly unworthy, and there is danger also that too many men will receive stipendiary encouragement to prepare themselves for positions they can never attain. In the early days of the French Academy when a seat in that body was a very great prize, a certain young man was told to wait until he was older, and the remark was added that in order to secure good speed from horses, a basket of oats should always be tied to the front of the carriage pole as a constant incitement. It would indeed be a misfortune if a system of fellowships should be open to this objection. Nevertheless, whoever scans our register of Fellows will discover that many of the ablest men in the country, of the younger generation, have here received encouragement and aid.

When this university began the opportunities for scientific publication in this country were very meager. The *American Journal of Science* was the chief repository for short and current papers. The memoirs of a few learned societies came out at slow intervals and could not be freely opened to investigators. This university in the face of obvious objection determined to establish certain journals which might be the means of communication between the scholars of this country and those abroad. Three journals were soon commenced: The *American Journal of Mathematics;* the *American Journal of Philology;* the *American Chemical Journal.* Remember that these were 'American' journals, in fact as well as in name, open to all the scholars of the country. Other periodicals came afterwards, devoted to History and Politics, to Biology, to Modern Languages, to Experimental Medicine and to Anatomy. Moderate appropriations were made to foreign journals, of great importance, which lacked support, the English *Journal of Physiology* and the German *Journal of Assyriology.* Nor were the appropriations of the Trustees restricted to periodical literature. Generous encouragement was given to the publication of important treatises, like the researches of Dr. Brooks upon *Salpa;* to the physiological papers of Dr. Martin; to the studies in logic of Mr. Peirce and his followers; to Professor Rowland's magnificent photographs of the solar spectrum; to the printing of a facsimile of the earliest Christian document after the times of the Apostles; and recently, with the cooperation of the University of Tübingen, to the exact reproduction by Dr. Bloomfield of a unique manuscript which has an important bearing upon comparative philology.

I am not without apprehensions that our example to the country has been infelicitous, not less than thirty institutions being known to me, which are now engaged in the work of publication. The consequence is that it is almost impossible for scholars to find out and make use of many important memoirs, which are thus hidden away. One of the problems for the next generation to solve is the proper mode of encouraging the publication of scientific treatises.

I cannot enumerate the works of scholarship which have been published without the aid of the university by those connected with it,—studies in Greek syntax, in mathematics, in history, in chemistry, in medicine and surgery, in economics, in pathol-

ogy and in many other branches. The administration now closing can have no monument more enduring than the great mass of contributions to knowledge, which are gathered (like the cairn of boulders and pebbles which commemorates in Cracow, the burial place of Kosciusko), a bibliothecal cairn, in the office of the Trustees, to remind every officer and every visitor of our productivity in science and letters.

There are many who believe that the noblest work in which we have engaged is the advancement of medical education and science. Several agencies have been favorable. The munificence of the founder established a hospital, which was recognized as soon as it was opened, as the foremost of its kind in Christendom. He directed that when completed it should be a part of the University and, accordingly, when the time came for organizing a medical and surgical staff, the principal professors were simultaneously appointed to the chairs of one institution, to the clinics of the other. They were to be constantly exercised in the relief of suffering and in the education of youth. For the lack of the requisite funds, the University at first provided only for instruction in those scientific branches which underlie the science of medicine. At length, the organization of the school of medicine was made possible by a very large gift of money, received from a lady of Baltimore, who was familiar with the requirements of medical science, and eager to see that they were met. By her munificence the University was enabled to organize and maintain that great department, which now reflects so much honor upon this city and which does so much by example, by publication, by systematic instruction, and by investigation to carry forward those varied sciences, anatomy, physiology, physiological chemistry, pharmacy, pathology, and the various branches of medicine and surgery. In accordance with the plans of the University, the generous donor made it a condition of her gift that candidates for the degree of Doctor of Medicine should be those only who had taken a baccalaureate degree based upon a prolonged study of science and the modern languages. A four years' course of study was also prescribed and women were admitted to the classes upon the same terms as men. The liberal and antecedent aid of women throughout the country in the promotion of these plans is commemorated by a building inscribed 'the women's fund memorial building.' The excellent laboratory facilities, the clinical opportunities, the organization of a training school for nurses, and especially the ability of the physicians and surgeons have excited abundant emulation and imitation in other parts of the country,—a wonderful gain to humanity. It is more and more apparent among us that a medical school should be a part of a university and closely affiliated with a hospital. It is also obvious that the right kind of preliminary training should be antecedent to medical studies.

I must ask the indulgence of our friends from a distance as I now dwell, for a moment, on the efforts which have been made to identify the Johns Hopkins University with the welfare of the city of Baltimore and the State of Maryland. Such a hospital and such medical advisers as I have referred to are not the only benefits of our foundation. The journals, which carry the name of Baltimore to every learned society in the world are a minor but serviceable advantage. The promotion of sanitary reform is noteworthy, the study of taxation and in general of municipal conditions, the purification of the local supply of water, the advancement of public education by courses of instruction offered to teachers, diligent attention to the duties of charity and philanthropy, these are among the services which the faculty have rendered to

the city of their homes. Their efforts are not restricted to the city. A prolonged scientific study of the oyster, its life history, and the influences which help or hinder its production, is a valuable contribution. The establishment of a meteorological service throughout the State in connection with the Weather Bureau of the United States is also important. Not less so is the Geological Survey of Maryland, organized with the cooperation of the United States Geological Survey, to promote a knowledge of the physical resources of the State, exact maps, the improvement of highways, and the study of water supplies, of conditions favorable to agriculture, and of deposits of mineral wealth, within this region. To the efficiency of these agencies it is no doubt due that the State of Maryland has twice contributed to the general fund of the university.

Nor have our studies been merely local. The biological laboratory, the first establishment of its kind in this country, has carried forward for many years the study of marine life at various points on the Atlantic and has published many important memoirs, while it has trained many able investigators now at work in every part of the land. Experimental psychology was here introduced. Bacteriology early found a home among us. The contributions to chemistry have been numerous and important. Here was the cradle of Saccharine, that wisely diffused and invaluable concentration of sweetness, whose manufacturers unfortunately do not acknowledge the source to which it is due. In the physical laboratory, light has been thrown upon three fundamental subjects:—the mechanical equivalent of heat, the exact value of the standard ohm, and the elucidation of the nature of the solar spectrum. For many years this place was the chief seat in this country for pure and advanced mathematics. The study of languages and literature, oriental, classical, and modern, has been assiduously promoted. Where has the Bible received more attention than is given to it in our Semitic department? where the study of ancient civilization in Mesopotamia, Egypt, and Palestine? where did the Romance languages, in their philological aspect first receive attention? To American and institutional history, persistent study has been given. Of noteworthy significance also are the theses required of those who are admitted to the degree of Doctor of Philosophy, which must be printed before the candidate is entitled to all the honors of the degree.

I might enlarge this category, but I will refrain. The time allotted to me is gone. Yet I cannot sit down without bringing to your minds the memories of those who have been with us and have gone out from us to be seen no more: Sylvester, that profound thinker devoted to abstractions, the illustrious geometer whose seven prolific years were spent among us and who gave an impulse to mathematical researches in every part of this country; Morris, the Oxford graduate, the well trained classicist, devout, learned, enthusiastic, and helpful, most of all in the education of the young; accomplished Martin, who brought to this country new methods of physiological enquiry, led the way in the elucidation of many problems of profound importance, and trained up those who have carried his methods to every part of the land; Adams, suggestive, industrious, inspiring, versatile, beneficent, who promoted, as none had done before, systematic studies of the civil, ecclesiastical, and educational resources of this country; and Rowland, cut down like Adams in his prime, honored in every land, peer of the greatest physicists of our day, never to be forgotten in the history of physical science. I remind you also of the early student of mathematics, Thomas Craig, and of George Huntington Wil-

liams, the geologist, whose memory is cherished with admiration and love. Nor do I forget those who have here been trained to become leaders in their various departments throughout the country. One must be named, who has gone from their number, Keeler, the gifted astronomer, who died as the chief of the Lick Observatory in California, whose contributions to astronomical science place him among the foremost investigators of our day; and another, the martyr Lazear, who, in order that the pestilence of yellow fever might be subdued, gave up his life for humanity.

Like clouds that rake the mountain summit,
Or waves that own no curbing hand,
How fast has brother followed brother
From sunshine to the sunless land.

It is sad to recall these interrupted careers. It is delightful to remember the elevated character of those I have named, and delightful to think of hundreds who have been with us, carriers to distant parts of our country and to other lands of the seeds which they gathered in our gardens of science. It is delightful to live in this age of bounty; it is delightful to know that the citizens of Baltimore who in former years have supplemented the gifts of the founder by more than a million of dollars have come forward to support a new administration with the gift of a site of unsurpassed beauty and fitness. A new day dawns. "It is always sunrise somewhere in the world."

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*INAUGURAL ADDRESS.**

It has been said that 'old men tell of what they have seen and heard, children of what they are doing, and fools of what they are going to do.' Your speaker, fearing to furnish data that may suggest to you his place in this system of classification, prefers this morning to deal with matters that are largely independent of time.

The American University as distinguished from the College is a comparatively recent product of evolution—or of creation. Being young, its character is not fully developed, and we can only speculate in regard to its future. On an occasion of this kind, when one of the young universities of the country is celebrating in a quiet way the twenty-fifth anniversary of its foundation, and when a new presiding officer makes his first appearance before a large assembly, it seems fitting that he upon whom has been placed the responsibility of guiding, for the present, the affairs of the University, should take the opportunity thus afforded of giving expression to a few thoughts that suggest themselves when one begins to reflect upon the significance of the University movement in this country. Everyone at all acquainted with educational matters knows that the differentiation of the University from the College is the most characteristic fact in the history of higher education during the past quarter century. It is well that we should ask ourselves, What does this tendency mean? Whither is the movement likely to carry us?

While, from the beginning, the authorities of the Johns Hopkins University have maintained a collegiate department as well as a graduate or university department, and have endeavored to make this as efficient as possible under existing circumstances, the subjects that present themselves in connection with this branch of our work are so familiar and have been so much discussed that I can pass over them now without danger of giving the impression that we consider these subjects of less importance than those more directly connected with the work of the University. At all events, in what I shall have to say, I propose to confine myself to the latter.

* By President Remsen, on the occasion of his inauguration as President of the Johns Hopkins University.

The idea that a student who has completed a college course has something yet to learn, if he chooses the career of a teacher or scholar, does not appear until quite recently to have taken strong hold of the minds of those who had charge of the educational interests of our country. Perhaps it would be better to put it in this way: They do not appear to have thought it worth while to make provision in the system for those who wanted more than the college gave. The college has for its object the important work of training students for the duties of citizenship, not primarily the duties of scholarship, and no one doubts that, in the main, they have done their work well. Nor does any one doubt that, whatever may come, the college has a leading part to play in this country. Collegiate work by its very nature necessarily appeals to a much larger number than university work. But college work requires no apologist nor defender. It appeals strongly to the American people, and it is well that this is so. The college is in no danger of annihilation, though the indications are that it will undergo important modifications in the future as it has in the past. Upon this subject much might be said, and I feel strongly tempted to enlarge upon it, notwithstanding the intention already expressed of confining myself to problems more directly connected with the university proper.

There is, however, one phase of the college problem that is so closely connected with that of the university that I cannot avoid some reference to it. There is a marked and rapidly growing tendency to make college work the basis of the work in professional schools. As is well known, some of our medical schools now require a college degree for admission. The average age of graduation from our leading colleges is so high that the students cannot begin their professional courses until they are from twenty-two to twenty-three years of age on the average. Then, too, the length of the professional courses is greater than it formerly was, so that some of the best years of life are taken up in preparatory work. One thing seems to admit of no denial, and that is that, in so far as it prevents students from beginning their professional studies or their work in business life until they have attained the age of twenty-two or twenty-three, our present system is seriously defective. The defect is one that must be remedied. Various efforts are now being made looking to improvement, but it is not yet clear how this problem will be solved.

In this country the name university in the new sense is frequently applied to one department, and that is the philosophical department. This has to deal with philology, philosophy, history, economics, mathematics, physics, geology, chemistry, etc.; in short, it comprises all branches that do not form an essential part of the work of the departments of medicine, law and theology. A fully developed university, to be sure, includes at least four departments—the medical, the legal, the theological, and the philosophical; or, in other words, the university faculty comprises faculties of medicine, of law, of theology and of philosophy.

The new thing in educational work in this country is the philosophical faculty of our universities.

This meets the needs of those students who, having completed the college course, and having, therefore, had a good general training that fits them for more advanced study, wish to go forward in the paths of learning, and, so far as this may be possible, to become masters of some special branch. Most of these students are preparing to teach in colleges and elsewhere, so that the philosophical department of the University is to-day a professional school just as much as the medical or the legal de-

partment. On the completion of the college course, the student holds the same relation to the philosophical department of the university as to the other departments, or to the professional schools, and the age question is fully as important in the case of the student in the philosophical faculty as in the case of those who are to enter the professional schools. Now, if it be conceded that the training of specialists—not necessarily narrow specialists, but necessarily those who are thoroughly grounded in some one subject—I say, if it be conceded that the training of specialists is essential to the growth of the highest scholarship, then by advancing the age of graduation from our colleges, we are interfering with the development of scholarship in the highest sense, because the greater the age of graduation from the colleges the less will these graduates be inclined, or be able, to take up the advanced work that is essential to convert them into scholars. But let me close what I have to say on this subject by the safe prediction that the time will come when the work of our colleges will be adjusted to the work of the various faculties of the university so that the passage from the one to the other will not involve something unnatural—either hardship to the student or a telescoping of college and university which now on the whole furnishes the best way out of the existing difficulty.

I have said that the new thing in educational work in this country is the philosophical faculty of our universities. The growth of the work of the philosophical faculty has, however, undoubtedly influenced that of the other faculties—more particularly the medical. Gradually the medical schools, those connected with the universities at least, are adopting university standards. The same is true to some extent of schools of law and of theology, so that, I think, it is safe to assert that the great activity that has characterized the work of the philosophical faculties of our universities has tended in no small measure to the improvement of the work of our professional schools. It has lifted them to a higher level, and that is a result that the world at large may congratulate itself upon.

One of the most remarkable facts in connection with what we may call the development of the university idea in this country, is the surprisingly rapid increase in the attendance upon the courses offered by our philosophical faculties during the last few years. In what I shall have to say I shall for the present use the term graduate student in the restricted sense which it has come to have, meaning a college graduate who is following courses offered by the philosophical faculty of some university, and excluding, therefore, those who are studying medicine, or law, or theology in universities.

I have recently asked the United States Commissioner of Education to help me answer the following questions:

1. How many graduate students were in the United States in the year 1850?

2. How many in 1875, and

3. How many in 1900?

The answers are these:

1. In 1850 there were 8 graduate students in all the colleges of the country. Of these 3 were enrolled at Harvard, 3 at Yale, 1 at the University of Virginia and 1 at Trinity College.

2. In 1875 the number had increased to 399.

3. In 1900 the number was 5,668.

At present the number cannot be far from 6,000.

In order that these facts may be properly interpreted we should know how many Americans are studying in foreign universities. The records show that in 1835 there were 4 American students in the philosophical faculties of German universities; in

1860 there were 77; in 1880, 173; in 1891, 446; in 1892, 383; in 1895, 422, and in 1898, 397.

These figures show clearly that the increase in the attendance at American universities is not accounted for by a falling off in attendance at German universities. On the other hand, they do show that for the last ten years at least there has been no increase in the attendance at German universities, but rather a slight decrease.

Six thousand students are, then, to-day pursuing advanced courses in our American universities, while not longer ago than 1875 the number was only about 400. In this connection it must further be borne in mind that during this period the colleges have not relaxed in their requirements. The tendency has been in the opposite direction. So that it means to-day more rather than less than it did in 1875 to be a graduate student. That there is an increasing demand for university work is clear and it seems to be destined to play a more and more important part in the development of our educational methods.

Now, what is the cause of the rapid increase in the demand for university work, or the rapid increase in the attendance upon university courses? No simple answer would be correct. Probably the principal direct cause is the increased demand on the part of the colleges, and to some extent of the high schools, for teachers who have had university training. The degree of Doctor of Philosophy being the outward and visible sign of such training, many colleges have virtually taken the ground that none but Ph.D.'s need apply. This would, of course, tend directly to increase the attendance at the universities. Operating in the same way is the multiplication of chairs in the colleges. While not long ago one man often taught a number of subjects, sometimes related, sometimes not, the college authorities are coming more and more to entrust a single subject to a single man. The old-fashioned professor who could teach any subject in the curriculum with equal success is a thing of the past except in a few remote regions. The university-trained man has largely taken his place, and the universities are spreading their influence into the nooks and corners of the country through these men.

I need not discuss this phase of the subject further. It will, I am sure, be acknowledged without argument that it is desirable that our college faculties should be made up of men who have enjoyed the best educational advantages. In supplying such men the universities are doing a work of the highest value for the country. If nothing else were accomplished by our universities they would be worthy of all the support they get. The results of their work in this direction are not as tangible as that of the work of the colleges, for the latter reach much larger numbers and in ways that can be more easily followed. But if we keep in mind the fact that the college is dependent upon the university for its faculty and that the character of the college is in turn dependent upon the character of its faculty, it will be seen that whatever good may come from the college is to be traced directly to work done by the universities. In order to keep our colleges up to a high standard it is absolutely necessary that our universities should be maintained on a high plane. This university work is not something apart, independent of other kinds of educational work. It is a necessary part of the whole system. It affects not only our colleges, but our schools of all grades, and must, therefore, have a profound influence upon the intellectual condition of the whole country. It is difficult, perhaps, to prove this, but it seems to me that the statements just made are almost self-evident truths.

But the universities are also doing another kind of work of importance to the

country. Through their specially prepared men they are doing something to enlarge the bounds of knowledge. To be sure, such work is also being done to some extent in our colleges and elsewhere, but the true home of the investigator is the university. This work of investigation is as important as the work of training men. What does it mean? All persons with healthy minds appear to agree that the world is advancing and improving. We see evidences of this on every side. Those results that appeal most strongly to mankind are, perhaps, the practical discoveries that contribute so much to the health and comfort of mankind. These are so familiar that they need not be recounted here. If great advances are being made in the field of electricity, in the field of medicine, in the field of applied chemistry, it is well to remember that the work that lies at the foundation of these advances has been done almost exclusively in the universities. It would be interesting to trace the history of some of these advances. We should find that in nearly every case the beginning can be found in some university workshop where an enthusiastic professor has spent his time prying into the secrets of nature. Rarely does the discoverer reap the tangible reward of his work—that is to say, he does not get rich—but what of it? He has his reward, and it is at least a fair question whether his reward is not higher than any that could be computed in dollars and cents.

The material value to the world of the work carried on in the university laboratories cannot be over-estimated. New industries are constantly springing up on the basis of such work. A direct connection has been shown to exist between the industrial condition of a country and the attitude of the country towards university work. It is generally accepted that the principal reason why Germany occupies such a high position in certain branches of industry, especially those founded upon chemistry, is that the universities of Germany have fostered the work of investigation more than those of any other country. That great thinker and investigator, Liebig, succeeded during the last century in impressing upon the minds of his countrymen the importance of encouraging investigations in the universities, and since that time the German laboratories of chemistry have been the leaders of the world. In Germany the chemical industries have grown to immense, almost inconceivable, proportions. Meanwhile the corresponding industries of Great Britain have steadily declined. This subject has recently been discussed by Arthur C. Green in an address read before the British Association at its meeting at Glasgow last summer. The address has been republished in SCIENCE, volume 2, page 7, of 1902. I call the attention especially of our business men to this address. I think it will show them that university work in some lines at least is directly and closely connected with the industrial position of a country. Speaking of the coal-tar industry, the author of the paper referred to says: "In no other industry have such extraordinarily rapid changes and gigantic developments taken place in so short a period—developments in which the scientific elucidation of abstract problems has gone hand in hand with inventive capacity, manufacturing skill, and commercial enterprise; in no other industry has the close and intimate interrelation of science and practice been more clearly demonstrated." And further on: "Again, besides the loss of material wealth which the neglect of the coal-tar trade has involved to this country, there is yet another aspect of the question which is even of more importance than the commercial one. There can be no doubt that the growth in Germany of a highly scientific industry of large and far-reaching proportion has re-

acted with beneficial effect upon the universities, and has tended to promote scientific thought throughout the land. By its demonstration of the practical importance of purely theoretic conceptions it has had a far-reaching effect on the intellectual life of the nation. How much such a scientific revival is wanted in our country the social and economical history of the past ten years abundantly testifies. For in the struggle for existence between nations the battle is no longer to the strong in arm, but to those who are the strongest in knowledge to turn the resources of nature to the best account.''

What I want to make clear by these quotations and references is that universities are not luxuries, to be enjoyed or not, as we may please. They are necessities. Their work lies at the very foundation of national well-being.

But there is another aspect of university work of greater importance than that of which I have spoken. I mean the intellectual aspect in the highest sense. The world is advancing in other ways than along material lines. While as I have pointed out, the material interests of the world are connected with the intellectual condition, there are thoughts, there are ideas, that are above material considerations, ideas pertaining to the history of mankind, to the origin and development of the universe, to the phenomena of life, to the development of thought, to the significance of religions. All these are of importance, and the character of a nation is determined by the extent to which these ideas are cultivated. There is call for investigation in every subject—in the various branches of philology, in history, in economics, in archæology, as well as in the natural sciences, and here again the universities furnish the workers and the workshops.

There are, then, deep-seated reasons for encouraging the work of our universities in every possible way. We cannot afford to let them languish. The interests involved are too great. The more clearly this is recognized the better for us.

The rapid advances that have been made in university work in this country have brought us somewhat suddenly face to face with new educational problems, and we have not yet had time to adjust ourselves to the new situation thus created. We are in the experimental stage. We are trying to determine how we ought to deal with our graduate students in order to get the best results; how, in general to make the work as efficient as possible.

As one who, with others, has been engaged for twenty-five years in studying the new problems and in attempting to solve them, I may be permitted to say a few words in regard to one of the most important problems that the universities have to deal with at present. I refer to the problem of the professors. Having been a professor for about thirty years, and having during that time known intimately many of those who belong to this class and worked with them, I feel that I may speak of the professor problem with some confidence.

The university is what the professors make it, and the president has no more important duty to perform than that of seeing that the various chairs are filled by the right kind of men. He should not take the full responsibility of selection. He should take all the good advice he can get. He is sure to have some that is bad. He should, however, not only take advice, but he should endeavor to determine for himself by every available means whether or not the persons recommended to him are worthy of appointment. He should not shirk this responsibility. A mistake in this line is almost as difficult to rectify as a mistake in the matrimonial line—perhaps

more difficult. It is, therefore, doubly important that an appointment should be made with great deliberation and with a full realization of the gravity of the act. It is not, however, the process of appointing that I wish especially to speak of, though much that is interesting to university circles might be said on this subject. It is rather the principles that are involved. What constitutes a good professor? What kind of men are the universities looking for? Is the supply of this kind of men equal to the demand? These are some of the questions that suggest themselves in this connection. Let me attempt to answer them briefly.

The development of universities in this country has created a demand for a kind of professor somewhat different from that demanded by the college. It would not be difficult to describe the ideal university professor, but we should gain little in this way. I shall assume that he has the personal traits that are of such importance in those who are called upon to teach. A man of bad or questionable character, or of weak character, is no more fit to be a university professor than to be a college professor or a teacher in a school. That is self-evident. At least it seems so to me. Leaving these personal matters out of consideration, the first thing that is essential in a university professor is a thorough knowledge of the subject he teaches and of the methods of investigation applicable to that subject; the second is the ability to apply these methods to the enlargement of the field of knowledge; and the third is the ability to train others in the use of these methods. But a knowledge of the methods, the ability to apply them, and the ability to train others in their use, will not suffice. The professor, if he is to do his duty, must actually be engaged in carrying on investigations both on his own account and with the cooperation of his most advanced students. This is fundamental. It may be said, and this cannot be denied, that there is much research work done that is of little value to the world, that, in fact, much of that which is done by our graduate students is trivial judged by high standards. It would be better, no doubt, if every professor and every advanced student were engaged upon some problem of great importance to the world. But this is out of the question in any country. Few men possess that clearness of vision and that skill in devising methods, combined with the patience and power of persistent application that enable them to give the world great results. If only those who can do great things were permitted to work, the advancement of knowledge would be slow indeed. The great is built upon the little. The modest toiler prepares the way for the great discoverer. A general without his officers and men would be helpless. So would the great thinker and skillful experimenter without the patient worker, 'the hewer of wood and drawer of water.'

Of so-called research work there are all grades. A man may reveal his intellectual power as well as his mental defects by his investigations. But it remains true that the university professor must be carrying on research work or he is failing to do what he ought to do. It is part of his stock in trade. He cannot properly train his students without doing such work and without helping his students to do such work. One of the best results of carrying on this research work is the necessary adoption of world standards. A man may teach his classes year after year and gradually lose touch with others working in the same branch. Nothing is better calculated to keep him alive than the carrying on of a piece of work and the publication of the results in some well-known journal. This stimulates him to his best efforts, and it subjects him to the criticism of those who

know. He may deceive his students and himself—no doubt he often does—but he cannot deceive the world very long. The professor who does not show what he can do in the way of adding to the knowledge of the world, is almost sure to become provincial when he gets away from the influence of his leaders.

Other things being equal, the professor who does the best work in his special branch is the best professor. The universities want leaders. Unfortunately, the number of these is quite limited, and it is not surprising that there are not enough to go round. It is becoming very difficult to find properly qualified men to fill vacant university professorships. Given sufficient inducements and it would be quite possible to 'corner the market.' There are at least half a dozen, probably more, universities in this country on the lookout for young men of unusual ability. They are snapped up with an avidity that is a clear sign of the state of the market. One of the greatest obstacles in the way of the advancement of our American universities to-day is a lack of enough good professorial material. Fortunately, the universities are themselves providing the means by which this obstacle may be overcome, though not as rapidly as we should like. That is, however, not the fault of the universities. Some deeper cause is operating. Nature does not seem to supply enough raw material. It is often raw enough, to be sure, but its possibilities are limited.

This, too, suggests another question of deep import for the intellectual development of our country. Do our ablest men enter universities and engage in advanced work? This is a question which it is very difficult, if not quite impossible, to answer. I think it is not uncommonly assumed that they do not; that our ablest men, our best thinkers, are not in the universities. It is often said that they are in the law or in business. It may be. Certainly the great jurists and the great business men seem to be relatively more numerous than the great university teachers. I should not think it worth while to touch upon this subject were it not for the fact that recently the suggestion has been made that some of the men who become great in other lines might be induced to enter the academic career if only sufficient inducements were offered. The proposition is that a marked increase in the emoluments of professors would tend to attract some of the best material from other fields. I do not feel sure of this. In any case, the subject is hardly worth discussing. Whatever improvement is to come will come slowly, and this is fortunate. A sudden increase of the salaries of the leading professors of this country to, say, $10,000 or more, would not suddenly change the status of these professors among their fellow men, and, while the professors might be pleased, and probably would be, the main question is, Would this change have any effect in the desired direction? Speculation on this subject seems to me of no value. If it be true that the men of the best intellects do not find their way into university circles, it is safe to assume that this is due to a great many conditions, and that the conditions are improving. The intellectual standards of our colleges and universities are gradually being raised. We cannot force matters.

The best thing we can do for our students is to give them good professors. Sumptuous laboratories, large collections of books and apparatus, extensive museums are well enough. They are necessary, no doubt. But I fear they are too much emphasized before the public. A university is, or ought to be, a body of well-trained, intelligent, industrious, productive teachers of high character provided with the means of doing their best work for their students, and therefore for the world.

The Johns Hopkins University cannot live on its past, however praiseworthy that past may have been. If the contemplation of the past has the effect of stimulating us to our best efforts, it is a profitable occupation. If it lulls us into inactivity, it is fatal. We should not, nor can we, escape criticism for present misdeeds by referring to a glorious past. We have, to be sure, inherited certain ideals that we should cherish. So, also, we have probably done things that we ought not to have done, and the study of our past may help us to see where we have made mistakes and to show us how to avoid them in the future. There is only one way to make a university what it ought to be, and that is by doing good work according to the highest standards. Professors and students must cooperate in this. With the right professors we shall have this cooperation. Students have the power of collective judgment that is probably fairer than the judgment of any individual. They will work well if their masters work well. The professor is teaching all the time. His duty to his students is not done when he dismisses them from the lecture room or the laboratory. His influence for good or evil is continuous and lasting.

Will you allow me a few personal words? Those of you who know most of the occurrences of last year know best that the office, the duties of which I formally assume today, came to me unexpectedly and against my wishes. My life up to the present has been spent as a teacher. I ask no higher occupation. There is none more rewarding. It would have been agreeable to me to continue in this occupation to the end. Indeed, even as matters now stand, I hope it will not be necessary for me to withdraw entirely from the work to which my life has thus far been devoted. On the other hand, I recognize to the full the importance of the new work to which I have been called, and I accept the new duties with the intention of using every effort to further the interests of this University. Having taken the step, I accept the responsibility. I cannot permit anything to interfere with the work of the presidency. I believe, however, that I shall not be obliged to give up that which is dear to me in the science of chemistry.

In conclusion, I wish to express my hearty thanks to my distinguished predecessor, to my colleagues, to the students of the University, and to this community for the kindness with which they have accepted my election. I could not ask for better treatment. In return, I can only promise to do all that in me lies to make this University worthy of its history, to make it as helpful as possible, not only to this community, of which I am proud to be a member, but to the State and to the country. It is my earnest wish, as I am sure it is yours, that the period upon which the University now enters may be at least as useful as that which now ends.

We have passed through a time of great anxiety. Causes have been in operation that have of late seriously interfered with our development. It is not strange that the world at large should have received the impression that the Johns Hopkins University has seen its best days. The fact is that the doleful stories that have been going the rounds have a slight basis. It is this: The growth of the University has been temporarily checked. It has not gone backward, but, for a time at least, it has stood still. I believe that a new day has at last dawned and that the onward march will soon be taken up. Our difficulties have by no means been overcome, but a magnificent beginning has been made. The public spirit and generosity of William Wyman, of William Keyser, of Samuel Keyser, of Francis M. Jencks, of William H. Buckler and Julian Le Roy White, are worthy of the highest commendation. These high-

minded men have started the new era. They have shown their confidence in the work of the University and set an example to their fellow men. I would not detract in the least from the praise due to every one of these gentlemen, but I am sure the others whom I have named will pardon me if in conclusion I exclaim, Long live William Wyman and William Keyser!

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*PRESENTATION OF CANDIDATES FOR HONORARY DEGREES.**

To the Assembly:

From time immemorial, it has been the custom of universities at festive celebrations, to bestow upon men of learning, personal tokens of admiration and gratitude. In conformity with this usage, our university desires to place upon its honor list the names of scholars who have been engaged with us in the promotion of literature, science and education. In accordance with the request of the Academic Council and in their name, I have the honor and the privilege of presenting to the President of the Johns Hopkins University those whose names I shall now pronounce, asking their enrolment as members of this 'Societas magistrorum et discipulorum.'

To the President:

MR. PRESIDENT: In the name of the Academic Council, I ask that several scholars, who pursued advanced studies under our guidance, without proceeding to degrees, be now admitted to the degree of Master of Arts, *honoris causâ,* and assured of our hearty welcome to this fraternity.

WILLIAM THOMAS COUNCILMAN,
BENJAMIN IVES GILMAN,
JOHN MARK GLENN,
CLAYTON COLMAN HALL,
THEODORE MARBURG,
WILLIAM L. MARBURY,
ROBERT LEE RANDOLPH,
LAWRASON RIGGS,
HENRY M. THOMAS,
JULIAN LE ROY WHITE.

MR. PRESIDENT: I have now the honor of presenting to you, one by one, a number of eminent men, recommended by a committee of the professors, and of asking you to admit them to the degree of Doctor of Laws, *honoris causâ,* in the Johns Hopkins University.

Three of these scholars were friends and counsellors of the Trustees before any member of this Faculty was chosen. They pointed out the dangers to be avoided, the charts to be followed, and during seven and twenty years they have been honored friends, by whose experience we have been guided, by whose example we have been inspired.

CHARLES WILLIAM ELIOT, President of Harvard University, oldest and most comprehensive of American institutions,—the Chief, whose wisdom, vigor, and devotion to education have brought him honors which we gladly acknowledge, which we cannot augment.

JAMES BURRILL ANGELL, teacher, writer, diplomatist, scholar, excellent in every calling, whose crowning distinction is his service in developing the University of Michigan, a signal example of the alliance between a vigorous state and a vigorous university.

ANDREW DICKSON WHITE, honored Ambassador of the United States in Germany, the organizer of Cornell University, whose diplomatic success increases the distinction he had won as an able professor, a learned historian, and a liberal promoter of science, literature and art.

With these early friends, I now present to you several men who have been associated with us in carrying on the work of this University:—

JOHN SHAW BILLINGS, able adviser of the Trustees of the Johns Hopkins Hospital respecting its construction, an authority on the history of medicine, a promoter of public hygiene, a famous bibliographer and the wise administrator of public libraries in the City of New York.

GRANVILLE STANLEY HALL, who planned and directed the first laboratory of experimental psy-

* On behalf of the University, by Dr. D. C. Gilman, President Emeritus, on the occasion of the celebration of the twenty-fifth aniversary of the founding of the University.

chology in the United States, and who left a professorship among us to become first President of Clark University in Worcester,—a learned and inspiring philosopher, devoted to the education of teachers in schools of every grade from the lowest to the highest.

James Schouler, successful lecturer and writer on law and history, a lover of truth, a diligent explorer of the historical archives of this country, author of a history of the United States, comprehensive and trustworthy.

John William Mallet, of the University of Virginia, one of that brilliant band of lecturers to whom we listened in the winter of 1876–77, an ornament of the University founded by Jefferson, where scholars of every birthplace are made to feel at home; where two of our earliest colleagues had been professors. He is a chemist of international renown, whose researches are an enduring contribution to the science that he professes.

Charles Doolittle Walcott, Superintendent of the United States Geological Survey, a government bureau of the highest standing, that extends its investigations to every part of the land, securing for other States, as it does for Maryland, an accurate knowledge of the structure and resources of the earth. The chief of this survey is a geologist whose administrative duties have not prevented his personal devotion to scientific research in which he maintains acknowledged eminence.

Simon Newcomb, professor of mathematics in the United States Navy, once professor here, who has carried forward the researches initiated by Copernicus. His astronomical memoirs, above the ken of ordinary minds, have caused his name to be enrolled in the learned academies of Europe among the great investigators of celestial laws.

I have now the honor to present to you two scholars from a neighboring commonwealth, the Dominion of Canada, the representative of the University of Toronto, and the representative of McGill University in Montreal, who came to rejoice with us in this our festival,—James Loudon and William Peterson. We welcome them in the brotherhood of scholarship which knows of no political bounds, appreciating what they have done to uphold the highest standards of education in two great universities, with which we are closely affiliated.

It is not easy to discriminate among our own alumni, so many of whom we honor and admire, but on this occasion I have been asked to present four candidates, all of whom are widely known as scholars.

Josiah Royce, a graduate of the University of California, one of the first to be called to a fellowship among us, and one of the first four Doctors of Philosophy in this University, Doctor Subtilis, now Professor in Harvard University, Gifford lecturer in two of the Scotch universities, historian, man of letters, and philosopher.

John Franklin Jameson, of the University of Chicago, one of the most accurate and serviceable students of the Constitutional History of this country, an editor of historical papers, whose rare erudition is always placed at the command of others in a spirit of generous cooperation.

Edmund B. Wilson, of Columbia University, a profound investigator and an acknowledged authority in biological science,—one of the men not seen by the outer world, who look deeply into the fundamental laws of organic life.

Woodrow Wilson, of Princeton University, writer and speaker of grace and force, whose vision is so broad that it includes both north and south, a master of the principles which underlie a free government, whom we would gladly enrol among us a Professor of Historical and Political Science.

I now present to you nine men, the number of the muses, each of whom, like others already presented to you, is a leader of higher education,—two from New England, two from the Central States, two from the far South, one from the Northwest, and two from the Pacific coast. These are all our collaborators,—sentinels on the watch towers, heralds of the dawn.

Francis Landey Patton, under whose presidency 'old Nassau Hall,' the College of New Jersey, has become the University of Princeton, revered as a preacher of righteousness, admired as an Abelard in dialectics, beloved as an inspiring teacher of theology and philosophy.

William Rainey Harper, interpreter of the Sacred Scriptures, a fearless leader, a skillful organizer, who has brought into the front rank the University of Chicago.

Charles William Dabney, of the University of Tennessee, a man of science, and Edward A.

ALDERMAN, of Tulane University in New Orleans, a man of letters,—two leaders in the advancement of education in the South, advocates of schools and colleges of every grade, and their zealous promoters.

NICHOLAS MURRAY BUTLER, whose enthusiasm, energy, and knowledge of the principles and methods of Education have given him distinction throughout the land and have led to his promotion to the presidency of Columbia University in the city of New York.

HENRY SMITH PRITCHETT, astronomer and geodesist, who went from his home in Missouri to distant lands, now to observe an eclipse, now a transit, who has been the distinguished head of the United States Coast Survey, and is now the head of a vigorous foundation in Boston, the Massachusetts Institute of Technology.

I present to you the two representatives of learning and scholarship in 'the new world beyond the new world,' a Grecian and a student of Natural History, BENJAMIN IDE WHEELER, President of the University of California,—an idealist worthy to represent the aspirations of Berkeley, and DAVID STARR JORDAN, the naturalist, who has led in the organization of the Stanford University, chiefs of two harmonious institutions, one of which was founded by private bounty, the other by the munificence of a prosperous State.

As this roll began with Harvard it ends with Yale. I present to you finally one of the strongest and most brilliant of this strong and brilliant company,—ARTHUR TWINING HADLEY, a writer and thinker of acknowledged authority on the principles of finance and administration, the honorable successor of Timothy Dwight as President of Yale University.

THE CHICAGO MEETING OF THE AMERICAN PHYSIOLOGICAL SOCIETY.

THE American Physiological Society held its fourteenth annual meeting at the University of Chicago, December 30 and 31, 1901. Notwithstanding the fact that the Society had hitherto met only in the East, there was a large attendance of members, and great interest was shown in the proceedings. The following new members were elected, making the total membership ninety-seven: Harvey B. Cushing, A.M., M.D., Associate in Surgery, Johns Hopkins University; Joseph Erlanger, M.D., Instructor in Physiology, Johns Hopkins University; Martin H. Fischer, M.D., Associate in Physiology, University of Chicago; Arthur W. Greeley, A.M., Assistant in Physiology, University of Chicago; E. Mark Houghton, Ph.C., M.D., Lecturer on Experimental Pharmacology in the Detroit College of Medicine; H. S. Jennings, Ph.D., Assistant Professor of Zoology, University of Michigan; Waldemar Koch, Ph.D., Assistant in Pharmacology, University of Chicago; David J. Lingle, Ph.D., Instructor in Physiology, University of Chicago; Elias P. Lyon, Ph.D., Assistant Professor of Physiology, University of Chicago; E. Lindon Mellus, M.D., Baltimore; George B. Wallace, M.D., Instructor in Pharmacology, University and Bellevue Hospital Medical College, New York. The Council for the past year was reelected, viz., Professors R. H. Chittenden, W. H. Howell, Frederic S. Lee, W. P. Lombard and W. T. Porter. The Council subsequently reelected as president Professor Chittenden, and as secretary and treasurer Professor Lee.

The scientific program was an unusually full one, thirty-two papers being presented. A considerable number of demonstrations, especially of new apparatus, were also made. Only a very brief outline of the program can be indicated here.

The Relation of Blood-plates to the Increase in the Number of Red Corpuscles at High Altitudes: Professor G. T. KEMP, University of Illinois.

The red corpuscles and the blood-plates were counted at Paris, and found to number, respectively, 4,800,000 and 457,000 per cubic millimeter. Seventy-two hours later,

the final twenty-four hours of which were spent at Görner Grat, Switzerland, the respective numbers were 7,000,000 and 1,206,900. The plates had thus increased much more than the red corpuscles. The predominance of plates of large size was very striking; the number of small red corpuscles was much greater than is seen in normal blood. The whole appearance suggested the *crise hématoblastique* of Hayem. The most careful search, however, failed to reveal plates colored by hæmoglobin.

Some New Observations on Blood-plates: Professor G. T. Kemp and O. O. Stanley.

The experiments of Dutjen have been repeated, and his statement corroborated, viz., that the plates exhibit amœboid movements when examined in proper media. From preparations made from the blood of animals, into whose circulation methylene blue had been injected, and examined by Dutjen's method, and from others studied by Macallum's method for the detection of phosphorus, the authors conclude that the plates consist of nucleo-proteid existing as granules scattered through the clear mass (of protoplasm?), which is capable of exhibiting amœboid movements.

Notes on the Physiology of the Circulatory System in the Hagfish, Polistotrema stouti: Professor C. W. Greene, University of Missouri.

The California hagfish possesses three well-developed hearts, the systemic heart, the portal heart and the caudal heart. The systemic heart is different from that in all craniate vertebrates so far examined, in that it possesses no regulative nervous system. The portal heart also is devoid of such a system. The caudal heart propels blood from the great lateral subcutaneous sinuses into the caudal vein. It was proved that these sinuses normally contain blood, and not lymph alone. The blood of the hagfish has a concentration very close to that of the sea water in which the animal lives. The lowering of the freezing point of hagfish serum is 1.934° C.—1.992° C., while that of sea water in Monterey Bay is 1.945° C.

The Mechanism of Fibrillar Contraction of the Heart: Professor W. T. Porter, Harvard.

On Further Experiments on the Importance of Sodium for the Heart-Beat: Dr. D. J. Lingle, University of Chicago.

Heart stimulants like caffein can not make strips of muscle from the ventricle contract, unless sodium chloride is present. A recovery from the standstill induced by sodium chloride alone occurs in oxygen gas and in solutions containing hydrogen peroxide, as well as in various salt solutions. Heart strips placed first in a solution of sodium chloride, and then transferred to oxygen gas contract as long and as well as they do in a solution of calcium or other salts.

On the Prolongation of the Life of Unfertilized Eggs of the Sea-urchin by Potassium Cyanide: Professor Jacques Loeb, University of Chicago, and Mr. Lewis.

Death is an active process due to enzyme action. Fertilization greatly retards it. In the eggs of the sea-urchin brief treatment with certain salts, such as potassium cyanide, acts like fertilization to retard the mortiferous processes.

The Action of Alcohol on Muscle: Professor Frederic S. Lee, Columbia, and Dr. William Salant.

A frog's muscle which has absorbed a moderate quantity of ethyl alcohol will contract more quickly, relax more quickly, perform a greater number of contractions in a given time, and do more work than a muscle without alcohol, while the onset of fatigue is at the same time delayed. In

larger quantities alcohol is detrimental, diminishing the whole number of contractions, inducing early fatigue and diminishing the amount of work that the muscle is capable of doing, even to the extent of doing away entirely with contractile power. In moderate quantities the alcohol is, at least temporarily, beneficial; in larger quantities poisonous. After-effects have not yet been studied.

The Excretion of Lithium: Mr. C. A. GOOD. (Presented by Professor A. R. Cushny, University of Michigan.)

Lithium chloride injected hypodermically in poisonous doses is excreted in large quantities by the alimentary tract. It is here that the chief symptoms of poisoning arise.

On the Question whether Dextrose is Produced from Cellulose in Digestion: Professor GRAHAM LUSK, New York University.

The feeding of cellulose in the form of paper to diabetic goats does not cause an increase of sugar in the urine; therefore, dextrose is not a product of the digestion of cellulose.

Experiments on the Relation Between the Spleen and the Pancreas: Professor L. B. MENDEL, Yale, and L. F. RETTGER.

These experiments were performed on dogs, and show that the extract of the spleen aids the transformation of the zymogen of the pancreas into trypsin. Similar results were obtained both within the living body and outside. The observations support the Schiff-Herzen hypothesis.

The Role of the Cell Nucleus in Oxidation and Synthesis: R. S. LILLIE. (Presented by Professor W. T. Porter, Harvard.)

New Experiments on Allantoin Excretion: Professor L. B. MENDEL, Yale.

Rectal injections of thymus gland substance in dogs were followed by characteristic excretion of allantoin in the urine. The diet was free from constituents yielding purin. Vegetable nucleic acids and nucleates from wheat germs experience transformations in metabolism comparable with those obtained from nucleins of animal origin. Allantoin and uric acid are excreted in noticeable quantity. Other physiological actions were studied after the introduction of nucleic acid into the circulation.

Studies on Diuresis: Dr. J. T. HALSEY, McGill.

Nussbaum's experiments on the circulation in and the function of the frog's kidney have been repeated, and it has been found that in the kidney in which the renal arteries have been tied some glomeruli are still supplied by the blood. In such cases the blood supply is so small that such glomeruli may be considered as physiologically negligible quantities. It seems a necessary conclusion that the substances which are excreted by the kidney under these conditions are excreted by the epithelium of the uriniferous tubules.

An Unrecognized Feature of Diuresis: Professor A. R. CUSHNY, University of Michigan.

The author's experiments had led to a conclusion somewhat the opposite of that of the preceding paper. Excretion occurs in the uriniferous tubules, but chlorides and water are excreted there much more readily than sulphates, phosphorus or urea.

The Physiological Effects of the Electrical Charge of Ions, and the Electrical Character of Life Phenomena: Professor JACQUES LOEB, University of Chicago.

The author has found that the stimulating power of chemical substances varies directly with the valence of the substance. The paper reviewed also some of the

author's previous work in the light of recent discoveries, and maintained that vital phenomena, in general, are caused by the electrical charges of ions.

The Nature of Nerve Stimulation, and Alterations of Irritability: Professor Albert P. Mathews, University of Chicago.

The irritability of nerve protoplasm varies inversely with the stability of the hydrosol state of its colloids. Stimulation is gelation, and is brought about by negative electrical charges. Chemical stimulation is really an electrical stimulation due to the charges which the ions bear. Negative charges stimulate, positive charges prevent stimulation. The nerve impulse is due to a progressive precipitation of colloids by negative charges, the negative charges being regenerated by the precipitation of each succeeding mass of colloids. The negative variation, in other words, stimulates each successive segment of the nerve, and is regenerated by the change it produces in the colloids. Anæsthetics prevent precipitation. It is not the valence, in ultimate analysis, which produces stimulation, but the movement of the charge, chemical stimulation being thus identical with stimulation by light.

The Effect of Potassium Cyanide and Lack of Oxygen on the Fertilized Eggs of the Sea-urchin, Arbacia: Professor E. P. Lyon, University of Chicago.

During each cleavage of the egg (tested to the third), there is a period of slight resistance to potassium cyanide and to lack of oxygen, followed by a period of much greater resistance. The period of least resistance comes about ten minutes after fertilization, and almost immediately after each succeeding cleavage.

Experiments with Zygadenus venenosus: Professor Reid Hunt, Johns Hopkins.

The author has made a chemical and physiological study of this poisonous plant. He has isolated an alkaloid or a mixture of alkaloids having most of the chemical and physiological characteristics of veratrine.

Demonstration of the Glands in the Oviduct of the Fowl: Professor A. R. Cushny, University of Michigan.

Four varieties of glands have been found, secreting, respectively, albumen, the soft membrane, the hard shell, and, apparently, mucus. The last variety has been hitherto undescribed. They are interposed between those secreting albumen and those secreting the soft membrane.

An Attempt to Obtain Regeneration of the Spinal Cord: Dr. Percy M. Dawson and Edwin N. Riggins, Johns Hopkins.

The animal, a young bitch, was nursed with the greatest care for one hundred and twelve days after the operation. Although the healing was *per primum,* with very little formation of scar-tissue, there was never any conclusive clinical evidence of conscious sensation, or of voluntary motion in the parts of the body supplied by the cord posterior to the section.

The Formula for Determining the Weight of the Central Nervous System in Frogs of Different Sizes: Professor H. H. Donaldson, University of Chicago.

It was shown that in the case of the bull-frog and leopard frog, the weight of the central nervous system (brain and spinal cord) was a function of the body-weight and length of the frog, combined.

If the weight of the central nervous system (in milligrams) $=N$;
length of the entire frog (in millimeters) $=L$;
weight of the body (in grams) $=W$;
and the constant coefficient $=C$;
then:

$$N\,1\,(\sqrt[4]{L}\log W)\,C.$$

In the case of the bull-frog $C=30$.
In the case of the leopard-frog $C=27.5$.

The Chemical Analysis of the Brain: Dr. W. KOCH, University of Chicago.

This paper was a preliminary report on the chemical analysis of nervous tissues, including methods for preparing cerebrin, cephalin and lecithin, in sufficient quantity for subsequent work.

The Study of Metabolism in a Case of Lymphatic Leukæmia: Dr. YANDELL HENDERSON, Yale.

In a typical case of lymphatic leukæmia, with the white corpuscles at 300,000 and the red corpuscles only 2,500,000, there was no increase in the excretion of nuclein decomposition products (uric acid and P_2O_5). The pathological condition, therefore, seems to be due, not to an increased nuclein metabolism, in general, but to a diminished katabolism. As nearly all the leukocytes are lymphocytes, this seems to be due to an arrest in their development—*i. e.*, they are not transformed, as normally, into other forms of white cells.

The Mode of Action of Certain Substances on the Colored Blood Corpuscles, with Special Reference to the Relation between So-called Vital Processes and the Physico-Chemical Structure of the Cells: Professor G. N. STEWART, Western Reserve University.

On the Surface Action of Metals: Professor F. G. NOVY, University of Michigan.

The author has studied with Professor Freer the conditions favoring the formation of organic peroxides. In Nef's method of preparing benzoyl acetyl peroxide, the reagents, benzaldehyde and acetic anhydride, are mixed with sand and exposed in a thin layer to the action of air, with the result that auto-oxidation takes place, and the peroxide is formed. That this change is one of surface action was demonstrated in various ways. If a strip of paper is introduced into the mixture, the yield of peroxide is increased by more than 200 per cent. Strips of cloth and various metals were tested in like manner, and gave similar results, showing that the rate of formation of this peroxide depends on surface action, and varies within wide limits with the kind of surface employed.

Demonstrations of apparatus for teaching and for research were made by Professors W. P. Lombard, University of Michigan; W. T. Porter, Harvard; W. S. Hall, Northwestern University; Graham Lusk, New York University and Bellevue Hospital Medical School; and G. P. Dreyer, University of Illinois.

FREDERIC S. LEE.

SCIENTIFIC BOOKS.

TWO NEW WORKS ON MOSQUITOES.

A Monograph of the Culicidæ, or Mosquitoes, mainly compiled from the collections at the British Museum from various parts of the world, in connection with the investigation into the cause of malaria conducted by the Colonial Office and the Royal Society. By FRED V. THEOBALD, M.A., F.E.S., London. Printed by order of the Trustees of the British Museum. 1901. 3 vols. Pp. 424, 391, pl. 37+5, text figures 318.

Mosquito Brigades and How to Organize Them. By RONALD ROSS, F.R.C.S., D.P.H., F.R.S. London, Geo. Philip & Son. 1902.

The literature of mosquitoes is becoming enormous. The number of scientific papers published about these insects in the last three years has been very great and is increasing almost daily. It is safe to say, however, that two books which will be greeted with the greatest pleasure by thousands of people who have become interested in the mosquito question are those the titles of which have just been given.

When the Royal Society, at the request of the Right Honorable Joseph Chamberlain, appointed a committee to cooperate with the officials of the Colonial Office in the investigation of the causes of malaria and the possibility of controlling that scourge of tropical lands, one of the first steps of the committee was to secure the services of Mr. F. V. Theo-

bald to prepare an illustrated monograph of the family Culicidæ, based upon the collections of the British Museum and upon the collections sent in by private individuals and collectors throughout the world. The date when this work was placed in Mr. Theobald's hands is not mentioned, but his work has certainly been done in little more than two years, and the results are displayed in the three volumes mentioned. The material at his disposal has been larger than has ever been brought together elsewhere and he has described in detail, with synoptical tables of subfamilies, genera and species, 340 species of Culicidæ, distributed in twenty-three genera, 108 of the species and 10 of the genera being new to science. Of the species, 131 belong to the old genus *Culex,* and of these 51 are new to science. Of the malaria-bearing genus *Anopheles,* 39 species are described, of which 12 are new to science. For North America 37 species are described, of which 5 are new, but the author calls especial attention to the fact that but little collecting of mosquitoes has been done upon the Pacific coast.

The end is by no means reached, since Ray Lankester, in his preface, states that collections are still arriving at the Museum, and it is to be hoped that this will continue for years to come; so that a supplementary volume will be necessary at no distant date to record additional species and correct present conclusions.

Mr. Theobald has given the world a remarkable monograph in a remarkably short space of time. His work is original in a high degree. In his preliminary matter, covering nearly a hundred pages, he enters extensively into the morphology of the group and its biology. He arrives at the interesting conclusion that the scale structure of these insects is one of the most important characters for both generic and specific distinction. This conclusion is of great importance, but is in a measure unfortunate for workers since it necessitates the use of a compound microscope in addition to the high-power hand lens for the proper separation of species. He establishes five new subfamilies of Culicidæ, namely, the Anophelina, the Culicina, Ædeomyina, Trichoprosoponina and Corethrina. It is unfortunate that these groups were not given the uniform subfamily *inæ* termination required by modern rules of zoological nomenclature, but after all this is a small point.

Especial care has been taken with the important subject of geographic distribution, and many interesting points have been brought out. As with other Diptera, these insects have apparently no great faunistic value, and many species, such as *Anopheles maculipennis, Culex pipiens, C. fatigans* and *Stegomyia fasciata,* are widespread.

The character and great number of the illustrations are worthy of especial commendation, and Mr. Theobald is heartily to be congratulated upon his great work; and the joint committee is to be congratulated as well upon the fact that it is able to secure a man who was able to perform this enormous task so successfully and in so short a space of time. The work is provided with a bibliography, defective in some respects, and with an index which might to advantage have been made somewhat more complete.

Realizing the necessity for concise and practical directions to communities, municipal and health organizations and individuals who wish to start a mosquito crusade, Major Ross, the distinguished investigator who first established the transfer of malarial parasites by mosquitoes and who has since directed the practical work which England has attempted to carry on in certain of her tropical colonies, has filled the want most excellently in his 'Mosquito Brigades.' The book is written by a man of highest scientific rank who is at the same time a practical man. His book is divided into sections, entitled, 'Things to be Learnt,' 'Things to be Done,' 'Summary,' 'Miscellaneous Remarks,' 'Appendix,' 'Books.' It is a handy little book of only 98 pages, but covers the ground in an admirable manner.

Taking the headings of his section, entitled 'Things to be Done,' for example, they are as follows: Appointment of Superintendent, The First Step, How to Raise Funds, Small Beginnings, Organization of the Brigade, Organization and Duties of the *Culex* Gang, Organization and Duties of the *Anopheles* Gang,

Destruction of Larvæ, Destruction of Adults, Last Stages of the Campaign. This is followed by a summary of the objects and a summary of the methods, to which is appended a motto, which Dr. Ross thinks will shortly become the first law of tropical sanitation, namely *'No Stagnant Water.'* Major Ross's book is based upon experience gained during many years' study of mosquitoes in many parts of the world, and more especially upon the actual results of the operations now being carried on under the Liverpool School of Tropical Medicine, in West Africa. A great deal is said which applies chiefly to tropical regions, yet the book as a whole should be in the hands of every one in this country who is interested in the fight against mosquitoes.

In his section on sanitary anarchy Dr. Ross complains bitterly of the inertia of the sanitary and medical branches of the Imperial Service, and points out by contrast the energetic measures adopted by our government in Cuba. The British authorities, he says, "love to ponder things. They will go on pondering for twenty years."

L. O. HOWARD.

The World and the Individual. Gifford Lectures Delivered before the University of Aberdeen. Second Series: *Nature, Man and the Moral Order.* By JOSIAH ROYCE, Ph.D., LL.D. (Aberdeen), Professor of the History of Philosophy in Harvard University. New York, The Macmillan Co. 1901. 8vo. Pp. xvii + 480. Price, $2.25, net.

Although it contains what may be called a philosophy of nature, this new series of Gifford Lectures presents less of direct interest to readers of SCIENCE than its predecessor. Accordingly, as a detailed philosophical criticism would be out of place here, it may suffice to give a general account of the work, and some indication of the author's standpoint.

The lectures, ten in number, fall roughly into three main parts and an epilogue. (1) Lectures I.–III. furnish what Mr. Royce himself calls 'a sketch of an idealistic Theory of Human Knowledge' (Preface, vi). Lecture IV., on 'Physical and Social Reality,' mediates between this Theory and the outline of a Philosophy of Nature, which follows. (2) Lecture V. supplies this outline, and an inkling of its purport may be obtained from the following passage. "Any hypothesis about Nature, which is just to the demands of a sound metaphysic, must, like ours, conceive the natural world as directly bound up with the experiences of actually conscious beings. That, in addition to all these considerations, we should be led to reject Berkeley's cosmological hypothesis, is due, in part, to our own special form of Idealism; but, in part, also to the fact that our theory about nature ought to be just to the empirical inductions which have now been summed up in the modern Doctrine of Evolution. The essence of this Doctrine of Evolution lies in the fact that it recognizes the continuity of man's life with that of an extra-human realm whose existence is hinted to us by our experience of Nature. Accepting, as we are obliged to do, the objective significance of this modern doctrine, we find ourselves forced to interpret Nature, not as an arbitrarily determined realm of valid experiences founded only in God's creative will and man's sensory life, but as an orderly realm of genuine conscious life, one of whose products, expressions, and examples we find in the mind of man" (241–2). (3) Lectures VI.–IX. discuss the self and the problems which occur in considering the relation of the self to a universe of physical and social reality, where it is at once a factor and the feature. Lecture X. contains the epilogue. Here, gathering up all the conclusions reached hitherto, Mr. Royce attempts to estimate the significance of the individual life in relation to the cosmic whole, and to that ultimate unity which natural religion terms God. Of course such an inquiry touches the conclusions of modern science at every point. But, for this very reason, it is difficult in any case, and impossible in a short review, to show what the point of contact is. Rather, each one who is interested must find out for himself by perusal of the entire argument.

Apart altogether from its considerable weight as a contribution to original metaphysical thought, the work has great significance

as an indication of prevalent philosophical tendencies in English-speaking lands. Save for the sporadic efforts of Coleridge and Carlyle in Britain, of Emerson and his group in this country, the English mind remained in long isolation from the transitive speculation of Europe, originated by Kant and Herder, cast abroad by Goethe, and systematized by Hegel. At length, in the sixties of the nineteenth century, thanks to Dr. Stirling, Wallace, the brothers Caird, Mr. W. T. Harris and the St. Louis circle, Hegel burst upon the Anglo-Saxon world, and threatened to carry all before him by the seventies. During the same years, the hypothesis of evolution, together with certain discoveries in physiology and physics, brought scientific men into contact with metaphysical problems which had been stilled awhile. Huxley's speculations, significant in their changes, Clifford's 'mind-stuff,' and similar so-called 'monistic' theories, were the result—a belated product being Haeckel's recent 'Riddle of the Universe.' While the immanent tendencies and animating problems happened to be much the same in both cases, it may be declared that the Hegelian and the Clifford-Huxley explanations could not be true together. As a matter of fact, each emphasized elements incident to the problem which the other minimized. A few of the younger men trained, like Mr. Royce, in the idealistic school, have come to clear consciousness of this situation; and, retaining the essential principle for which Hegel stands, have striven to rid themselves of his formalistic baggage, so affording opportunity for a fuller recognition of the scientific standpoint and—more important—of the scientific conscience. On the whole, then, these lectures are essentially mediating. This constitutes their strength now, and will prove their weakness twenty years hence. They cleave to the idealistic as opposed to the 'monistic' solution. On this ground I have no fault to find with them.

At the same time, I am by no means satisfied that the implications of 'monism' have been threshed out thoroughly, even if the discussion differ widely, as it does, from such cavalier treatment as that accorded, say, by Professor Pringle Pattison in the new 'Dictionary of Philosophy.' Moreover, I have very serious misgivings about the evident reversion to Fichte manifested by Mr. Royce. Nevertheless, his lectures constitute a thoroughly characteristic contribution—one that cannot be overlooked—to the very meaningful development within the English sub-Hegelian school. And if Mr. Royce appear to look back more than Mr. F. H. Bradley or Mr. Ellis McTaggart, one must perhaps hold the lecture-form of his work partly responsible. I am still haunted by the idea, to which I have given expression more than once, that it is a real misfortune that Mr. Royce should have produced so extended a series of books dominated by this method. For, as he himself says, 'In the public lecture-room the hearer has no time to meditate, and the speaker too little opportunity to be either concise or exhaustive.' We await the 'system' therefore. Like little girls, we believe in the man in the moon, but, like older girls, we would believe more in the man in the honeymoon.

R. M. Wenley.

University of Michigan.

SCIENTIFIC JOURNALS AND ARTICLES.

Popular Science Monthly for February is of more than usual interest for the general reader. The first article, on 'Stellar Evolution in the Light of Recent Research,' by George E. Hale, shows how much knowledge has been gained by the use of the camera and spectroscope. In 'Winged Reptiles' S. W. Williston tells of the pterodactyls, and particularly of the great American toothless species of the genus *Ornithostema,* which includes the largest flying animals. Appropriately following this is 'The Journeyings of Birds,' by F. H. Knowlton, which gives an excellent résumé of the subject of bird migration, and Otis T. Mason discusses 'Environment in Relation to Sex in Human Culture'; and R. H. Thurston, in 'The College Man as Leader in the World's Work,' expresses his belief that the educated man will in the future be even more in the front than now. Charles B. Dyke treats of 'Theology *versus* Thrift in the Black Belt,' believing that the religious teaching received

by the average negro is apt to make him care little for the things of this world, and is thus a drawback to him, while Lindley M. Keasbey intimates, in 'The Descent of Man,' that his physical inferiority to beasts of prey acted as a stimulus to his brain.

The Osprey for January begins a new series in a new garb, with new type. It contains 'The California Jay,' by D. A. Cohen; 'Random and Reminiscent Maine Bird Notes,' by W. C. Kendall; 'August Birds of Stony Man Mountain, Virginia,' by William Palmer; and a review of the 'Life and Ornithological Labors of Sir John Richardson,' by Theodore Gill. A review of 'Animals of the Past' includes reproductions of the restorations of *Phorochacos, Archæopteryx* and *Hesperornis*. Also, in the form of a supplement we have the first part of a 'General History of Birds,' starting with an interesting history of the etymology of bird.

The Museums Journal of Great Britain, for January, under the title 'The Man as Museum-Curator,' has an appreciative notice of Dr. G. Brown Goode in a review by F. A. Bather of the memorial volume published by the Smithsonian Institution. There is also a good article, 'On the Arrangement of Mineralogical Collections,' by J. G. Goodchild, and notes on 'New Zealand Museums' and 'Oxford Museums,' besides a long list of General Notes, which as a rule constitute a most, if not *the* most, interesting portion of scientific periodicals.

SOCIETIES AND ACADEMIES.

THE CHICAGO SECTION OF THE AMERICAN MATHEMATICAL SOCIETY.

THE tenth regular meeting of the Section was held at Northwestern University, Evanston, Illinois, on January 2 and 3, 1902. Four sessions were devoted to the reading and discussion of the following papers:

(1) Professor M. W. HASKELL: 'A fundamental theorem in the geometry of the tetrahedron.'

(2) Professor M. W. HASKELL: 'A theorem for the twisted cubic analogous to Pascal's theorem.'

(3) Professor M. W. HASKELL: 'A special cubic transformation in space.'

(4) Professor H. S. WHITE: 'Note on a twisted curve connected with an involution of pairs of points in a plane.'

(5) Dr. J. W. GLOVER: 'On the derivation of the asymptotes of an algebraic curve from the definition' (preliminary communication).

(6) Professor ARNOLD EMCH: 'Algebraic transformations of a complex variable realized by linkages.'

(7) Professor L. W. DOWLING: 'On the conformal representation of the isosceles triangle containing an angle of 120 degrees.'

(8) Professor E. H. MOORE: 'On Hilbert's plane desarguesian geometry.'

(9) Dr. F. R. MOULTON: 'A simple non-desarguesian geometry.'

(10) Dr. JACOB WESTLUND: 'Note on multiplying perfect numbers.'

(11) Dr. JACOB WESTLUND: 'On the class number of a particular cyclotomic number-field.'

(12) Dr. CHARLES L. BOUTON: 'The equivalence of linear differential equations for a transformation of the independent variable.'

(13) Dr. T. P. HALL: 'An algebra of space.'

(14) Professor J. B. SHAW: 'Commutivity of matrices and application to the theory of linear associative algebra.'

(15) Dr. H. G. KEPPEL: 'A cubic three-way locus in four-fold space.'

(16) Dr. J. C. FIELDS: 'An equivalent of Plücker's formulæ.'

(17) Professor H. B. NEWSON: 'On the product of linear substitutions.'

(18) Professor G. A. MILLER: 'On the groups of order p^m which contain operators of order p^{m-2}.'

(19) Professor L. E. DICKSON: 'Some simplifications in the theory of linear groups.'

A topic of a more distinctly pedagogical character was introduced by Professor Townsend, namely, the question of uniformity in the requirements for the Master's degree where mathematics is the major subject, and the allied question of equivalent credits for students migrating from one institution to another. After some discussion the matter was referred to a committee for report at the next meeting of the Section. An enjoyable feature of the meeting was the dinner served in one of the University buildings to the members present, and followed by an exhibition by Dr. Keppel of about fifty portraits of eminent mathematicians.

At the business session the secretary was re-elected for the ensuing year and associated with him on the program committee were Professors Townsend and Dowling.

THOMAS F. HOLGATE,
Secretary of the Section.

THE TORREY BOTANICAL CLUB.

AT the annual meeting of the Club, held on January 14, the Secretary reported 15 meetings held with an attendance averaging 20; 28 active members elected, total present active membership 238. Alternate meetings have been held at the Botanical Garden at Bronx Park and at the College of Pharmacy. The number of scientific papers has been 26, besides about 34 informal notes.

The editor in chief, Professor Underwood, reported issue of the largest volume of the *Bulletin* in its history, 706 pages and 48 plates. It is the intention to make the *Bulletin* a necessity to botanists the world over. The monthly index of recent literature has been reprinted as usual in card form and includes 983 titles for 1901, an increase of 127. Volume 10 of the *Memoirs,* including the first part of E. S. Burgess' 'Aster Studies' is nearly through the press. No. 1 of Vol. 11, Mr. Griffiths' memoir on North American Sordariaceæ, has been printed. The principle adopted with the issue of Vol. 7 to make the memoirs pay for their own publication has been eminently successful. An increased sale of recent volumes and of sets was reported. The following forthcoming publications were announced: In Vol. 8, the conclusion of Professor Lloyd's studies on the embryology of the Rubiaceæ; by Dr. A. W. Evans, 'A Monograph of the Lejeuneæ of the United States and Canada'; by Mrs. E. G. Britton and Miss Alexandrina Taylor, 'The Life History of *Vittaria lineata;* in Vol. 11, 'The Ulothricaceæ and Chætophoraceæ of the United States,' by Mr. T. B. Hazen; Vol. 12, the second part of E. S. Burgess' 'Aster Studies.'

Dr. M. A. Howe, the editor, reported an encouraging first year for *Torreya,* the monthly started by the club with January, 1901, for briefer notes and botanical matter of a more popular nature.

Dr. J. K. Small reported on the recent installation of the club's herbarium at the Botanical Garden, where it is now to form the nucleus of a representative local collection to cover the flora of New York and vicinity within the 100-mile limit.

The annual election followed, the officers elected including Hon. Addison Brown, *President;* Dr. T. F. Allen and Dr. H. H. Rusby, *Vice-Presidents;* Professor F. E. Lloyd, *Treasurer;* Edward S. Burgess, *Recording Secretary;* Dr. L. M. Underwood, *Editor of the Bulletin;* Dr. M. A. Howe, *Editor of Torreya.*

E. S. BURGESS,
Secretary.

GEOLOGICAL SOCIETY OF WASHINGTON.

THE 123d meeting was held January 22. The first paper, 'The Development of Septa in Paleozoic Corals,' by Dr. J. E. Duerden, gave an account of some of his recent results on the mesenterial and septal development of modern and fossil corals. After referring to the difference in this respect between *Porites* and *Madrepora* as compared with most other recent corals, the author proceeded to show how closely the septal development in the Palæozoic Rugose corals conforms with the mesenterial sequence in living Zoanthid polyps. Serial sections of the Carboniferous *Lophophyllum proliferum* (McChesney) demonstrate that the primary stage in the growth of this coral is six-rayed, and that in the subsequent development new septa are added successively within only four of the six primary interseptal chambers. The relationships can also be confirmed by means of the external ridges and grooves on the corallum.

The facts prove that while in their primary stage the Rugosa are hexameral, yet they can not be brought into close relationship with modern corals, but are undoubtedly allied to the Zoanthids which flourish to-day mainly in tropical seas. In the past the Zoanthids probably bore much the same relationship to the Rugose corals which living Actinians hold to recent corals.

The second paper, entitled 'The Mesabi Iron Range,' was presented by Mr. C. K. Leith.

Mr. Leith discussed certain new developments in the geology of the Mesabi iron range of Minnesota. He showed that the Keewatin series of the Minnesota Survey comprises two distinct series—an igneous 'basement complex' and a sedimentary series. The former is classed as Archean and the latter as Lower Huronian by the United States Geological Survey. The district therefore shows a complete succession from the Archean through the Lower Huronian into the Keewenawan, and in the fullness of the succession and in the clear-cut unconformities the Mesabi may be regarded as the type of Pre-Cambrian district of the Lake Superior region.

The iron ores result from the alteration of certain peculiar rocks composed of aggregates of minute green granules. The granules were called *glauconite* by Spurr, and were supposed to be of organic origin. The present investigation, however, shows them not to be glauconite. They are composed essentially of ferrous iron and silica, and lack potash, a constituent essential to glauconite. The granules, it is believed, were developed in much the same manner as the iron carbonates, which are the original iron-bearing rocks of the older iron districts. The iron (derived from the disintegration of older basic rocks) was carried in a ferrous form into the ocean, which was depositing iron formation material, and was there precipitated as hematite or limonite, and at the bottom of the ocean was again reduced by organic matter to a ferrous form, and then combined with silica, giving the substance we now find. The occurrence of the substance in granules is due to the same causes as the oolitic structure in limestone. After the iron formation, thus formed, emerged from the sea, weathering and the concentration of the ore began. The ferrous silicate was broken up and the iron oxidized. As the work was done through the agency of percolating underground waters, the position of the ore deposits was determined by the laws of flowage of such waters. The deposits are now found in gently pitching troughs formed by the gentle folding of the iron formations and bottomed by slaty layers, or their altered equivalents, the paint rock, in the iron formation.

Dr. Whitman Cross then made some comments on an article by Mr. Bailey Willis dealing with stratigraphic classification. Dr. Cross expressed the belief that a geologic map should express as much of geologic development as practicable; that a map whose cartographic units were discriminated solely on the lithologic characters of the so-called 'lithologic individuals' was not entitled to be called a geologic map. It was really a lithologic map. He contended that in order to express geologic development the units of cartography must be established with due regard to all classes of available facts, and that restrictions were both undesirable and unnecessary.

ALFRED H. BROOKS,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE ENDOWMENT OF RESEARCH.

TO THE EDITOR OF SCIENCE: In SCIENCE of February 8, 1901, N. S., Vol. XIII., p. 201, there is an article by Professor E. C. Pickering remarking on and requesting suggestions in regard to the reasons why there is so little demand for grants from various funds which are available for research. I had hoped that some one with wide experience would have some suggestions to offer on this subject. But since no one, so far as I am aware, has published a reply, I am moved to offer a few thoughts of my own. I feel inclined to do so at this time because Mr. Carnegie has just endowed research on a magnificent scale, and, as some of the difficulties which have confronted Professor Pickering will doubtless confront the trustees of this fund, a discussion of the matter seems particularly desirable.

The lack of requests for research funds is not because there is lack of desire to do research work. There are plenty of students eager to investigate questions in which they are interested. More than a dozen have mentioned such a desire to me within the last ten years. Two or three of these were Harvard or Technology graduates, amply prepared by training to carry on such researches. I have

told all of them of the different research endowments with which I was acquainted and mentioned especially the two funds in which I know Professor Pickering is interested as a trustee. However, I think not one of these persons applied for an appropriation from these funds.

I have sought the reasons for this, and I believe the chief one is that each person feels that in case such funds are granted he will be expected to give in return some tangible result or discovery, and who can tell when entering an unknown country whether anything will be discovered worthy of the name? The student may be compared to De Soto entering a new country in search of gold. He may find nothing but seemingly interminable forests, passage through which is beset by pain and even danger, and he may return discouraged without the expected gold, his work being regarded by himself and by the friends who helped him as an absolute failure. And yet, as De Soto discovered a land the great forests of which returned more value in gold than the wildest dream of the explorer, and where fertile valleys now support a population whose total wealth must be counted by millions of dollars, so a student seemingly finding nothing may really have discovered facts which a succeeding generation will consider of inestimable value. Even negative results are frequently of great value in pointing out the true road to the subsequent explorer. In my opinion, then, research funds should be administered in the broad spirit that all results are valuable, and while the funds should made to feel that all that is required of him is be granted judiciously, the student should be an earnest effort in quest of truth and a guarantee that such an effort has been made.

The feeling that the trustees of these funds expect definite results has, I know, in my own case, except in one instance, deterred me from asking for grants. Many lines of investigation suggest themselves to me, and some of them I feel might be approved by the trustees, but I cannot be sure that the results will be what I had hoped or even worthy of publication; so I refrain from asking for grants, preferring to spend my own money, however inadequate, in order that I may be free to publish results when I have any worthy of publication, and refrain when I have none.

Another reason why students do not apply for research endowments is because they are usually granted in sums so small as to be entirely inadequate for the work. No one can estimate exactly, and usually not even approximately, how much money it will take to penetrate an unknown region or attain an unknown result. He may find that if he accepts a small amount it will prove only adequate to allow him to learn the difficulties of the situation, and yet insufficient to allow him to obtain any results whatever. A remedy would be to give larger and less numerous amounts, or assure the student of more if the preliminary study is promising.

A third reason why many students do not apply is that most of the grants stipulate that no money must be spent for personal expenses. If a student is not wealthy this requirement means that he must give his best thought and spend the main part of his energy in earning a living, a duty which he cannot shirk, and give to research only the remaining fragments of his time, and perhaps a weary brain. Few care to undertake it. This aspect of the case, from the teacher's standpoint, is given by Professor E. L. Nichols in the article in Science which immediately follows that of Professor Pickering (Vol. XIII., p. 203). He says, "The tax upon the nervous system of the proper teaching of science is very great, and it is more often the want of surplus energy with which to carry on an investigation, than lack of actual time or of the necessary equipment that defeats us."

If the student has wealth he does not need endowments and usually does not ask for them, but prefers instead to give them. If all men with equal opportunities were equally capable of research, as is frequently, but erroneously, assumed, this restriction of research funds would not matter since the work of research could be left to the classes having wealth and leisure, while the others could do the necessary daily work of the world. But the talents of men are diverse. The military

genius of a Grant may be associated with an inability to acquire or even retain wealth. Inventions which have added enormously to the wealth of the nation have been made by men so poor that they were obliged to borrow money for living expenses. A prominent patent attorney with much experience recently said to me that he thought inventors as a class were without business ability, that is, without the ability to turn advantageously the product of their brains into money by means of which they could have leisure to do other work. No one can say how much the world has lost by the inability of the properly qualified men to give their best thought to discovery and invention. Had such a fund as that given for research by Mr. Carnegie been available in the past and been properly administered, the human race would in my opinion have been transformed into something immensely better than we have at present.

Hence, I believe that research funds, instead of prohibiting the payment of the personal expenses of the investigator, should be mainly devoted to the payment of such expenses, so that the investigator might be allowed to devote his whole time and his best thought to the investigation, even if for only a short time.

The funds thus administered would have plenty of applicants, and much work would be thrown on the trustees in seeing that the appropriations were made to the proper persons and properly used, but this is a task I think the trustees ought to assume.

H. H. CLAYTON.

HYDE PARK, MASS.,
Jan. 21, 1902.

A RARE 'WHALE SHARK.'

TO THE EDITOR OF SCIENCE: The National Museum has obtained a skin of a rare 'whale-shark,' *Rhinodon,* from an eighteen-foot specimen found on the beach three miles north of Ormond, Florida, January 25, 1902, this being the first record of the occurrence of the genus on the Atlantic coast of America. The Museum is indebted to Messrs. Anderson and Price, managers of the Hotel Ormond, who telegraphed the discovery to the Smithsonian Institution and later had the skin removed and shipped to Washington under instructions from Dr. F. W. True, Head Curator, Department of Biology.

Rhinodon typicus was first figured and described by Dr. Andrew Smith in his illustrations of the zoology of South Africa, in 1841, the type being a sixteen-foot example found at the Cape of Good Hope.* Another one of this species taken at the Seychelle Ids. is known from the teeth only.†

A genus related to *Rhinodon* was described by Dr. Theodore Gill in the proceedings of the Academy of Natural Sciences of Philadelphia, 1865, p. 177, under the name *Micristodus,* from jaws, vertebræ and notes, received by the Smithsonian Institution in 1858, from Captain Stone, and taken from a twenty-foot shark captured in the Gulf of California, where it was known as the *'Tiburon ballenas,'* or 'Whale Shark.'

BARTON A. BEAN.

U. S. NATIONAL MUSEUM,
WASHINGTON, D. C.,
Feb. 8, 1902.

RECENT PROGRESS IN GLACIOLOGY.

OUR knowledge concerning glaciers past and present is gradually being extended by local studies in various parts of the earth. For several years, systematic effort has been made to record observations on the movements of existing glaciers for the sake of determining the conditions and laws governing their advance and retreat. Harry Fielding Reid has published a number of articles bearing on this general topic in recent years. The last of these articles‡ presents a summary of existing knowledge on the present phases of glacier movement in various parts of the world, with reference to advance and retreat.

Most of the glaciers of the Swiss Alps are retreating. In the eastern Alps about one half are retreating, while about one fourth are stationary, and nearly as many advancing. In

* Preserved in the Museum of the Jardin des Plantes, Paris.

† British Museum.

‡ 'Variations of Glaciers,' *Journal of Geology,* Vol. IX., pp. 250–254.

other parts of the Alps retreat is the rule. The meager records from Scandinavia indicate general retreat for the glaciers which have been under observation. The few available records from the United States (including Alaska), Canada, Greenland and Russian Asia indicate the same phase of glacier movement. In the Himalayas there has been little change observed in recent years. More extensive observations, carried on through long periods of time, are much to be desired.

A significant conclusion has been reached by Myron L. Fuller* in his studies of the glacial drift of eastern Massachusetts. He finds evidence of two distinct sheets of till, the lower being differentiated from the upper, both physically and lithologically. The physical difference is such as to indicate that the underlying sheet of till was subjected to extensive decay before the overlying sheet was deposited. This conclusion is in harmony with the recent interpretations put upon the drift in other parts of the State by other geologists, and with the interpretations which have long been given to the drift of the Mississippi basin.

Glaciation has been determined† in Siberia between the parallels of 35° and 36°, and near the 93d meridian there is evidence of glaciation in an area about one hundred square miles in extent. Among the glacial features are drumlins and cirques. Elsewhere cirques occur in the high Altais, and glaciers are now found in the same mountains about the sources of the Irtish River, near the Mongolian border, at elevations of about 10,000 feet.

Several points of interest in connection with the Pleistocene glaciers in the western part of the United States have been determined during the past year.‡

Mr. Wallace W. Atwood has been studying the glacial drift of the Wasatch mountains, and has determined the positions of 50 Pleistocene glaciers exceeding a mile in length. Of these, ten exceeded five miles in length; fourteen descended to an altitude of less than 6,000 feet, and seven to an altitude of 5,000 feet. Seven of these glaciers reached the shore-line of Lake Bonneville. The elevation necessary to give rise to a glacier was about 9,000 feet. Mr. Atwood and his party also found that the drift of the Wasatch mountains is referable to two distinct epochs of glaciation. In the valley of the North Fork of the American Fork, the two sheets of drift, produced by glaciation from nearly opposite directions, are separated by a soil thicker than that which covers the surface of the upper sheet of drift. Other evidences of the duality of the glacial period in this region are found in the unequal weathering to which different parts of the drift have been subjected, and in the unequal amount of erosion which the drift of different localities has suffered.

Pleistocene glaciation has been determined in the mountains of New Mexico near Santa Fe. The glaciation, so far as determined, was between the parallels 35° 45′, and 36°, and between the meridians of 105° 35′ and 105° 50′. Within this area, the positions of something like 50 Pleistocene glaciers have been determined, chiefly by Messrs. John Webb and William A. Averill. Study was carried far enough to indicate that local glaciation was the rule, in the vicinity of altitudes reaching or exceeding 12,000 feet. Some of the glaciers reached a length of several miles. The glacial features found in this region are such as are developed by small mountain glaciers.

Pleistocene glaciers were found to have existed on the north slopes of the Spanish Peaks of Colorado. The glaciers here were less extensive than might have been anticipated from the elevation of the mountains, but their small size is probably the result of the small extent of the areas attaining the requisite height.

In northwestern Montana, east of the Rocky mountains, Mr. F. H. H. Calhoun has studied the relations of the drift deposited by the Keewatin ice sheet to that deposited by the glaciers coming out to the eastward from the mountains. It appears from his work that the Wisconsin drift extended somewhat farther to the westward than has been supposed, reach-

* 'Probable Representatives of Pre-Wisconsin Till in Southeastern Massachusetts,' *Jour. of Geol.*, Vol. IX., pp. 311–329, 1901.

† 'A Single Occurrence of Glaciation in Siberia,' *Am. Geol.*, Vol. XXVII., pp. 45–47, 1901.

‡ 'Glacial Work in the Western Mountains in 1901,' by Rollin D. Salisbury. *Jour. of Geol.*, Vol. IV., pp. 718–731.

ing nearly to the Rockies in the region mentioned. The drift of the northeastern ice sheet overlapped that coming from the mountains, just south of the 49th parallel. This relation of the two bodies of drift shows that the continental ice sheet reached its most advanced position after the valley glaciers from the west had retreated. There is no evidence, however, that the interval between the deposition of the two bodies of drift was considerable. The Sweet Grass Hills, just south of the 49th parallel, and thirty miles back from the edge of the ice sheet, were nunataks. The slope of the surface of the continental ice sheet between its edge and the Sweet Grass Hills is estimated to have been about 50 feet per mile. A long narrow lake existed in front of the Keewatin ice sheet, the standing water resulting from the obstruction of drainage by the ice. The present drainage of the region is in many respects notably different from that which obtained in pre-glacial times.

Messrs. George Garrey and Eliot Blackwelder, partly in company with the writer and partly alone, made a number of determinations with reference to Pleistocene glaciation west of the Rockies and east of the Cascades. The boundaries of the Okanogan or Coulee City (Wash.) ice lobe, south and east of the Columbia River, were traced out. This ice lobe had previously been made known by Russell, and its general limits indicated. Messrs. Garrey and Blackwelder also determined the existence of a great glacier down the valley of the Columbia just west of the 118th meridian. This glacier descended the valley of the Columbia to the point where the Spokane River comes in. The eastern margin of this glacier looped northward around Huckleberry Mountain (Tp. 32, R. 38 E.), and to the east of this point another glacier descended the valley of the Colville River. These two glaciers were, therefore, separated only at their southern ends, becoming continuous to the north. The eastern margin of the Colville glacier, which descended to Springdale, probably connects around Old Dominion Mountain with the ice which descended the Pend d'Oreille valley. The ice of this valley descended southward to a point three miles southwest of Davis Lake. A few data were also gathered concerning glaciation at points farther east.

Extensive deposits of loess were found in eastern Washington and northeastern Oregon. In geographic distribution, the loess corresponds, in a general way, with the wheat-growing areas of these States. Beds of volcanic ash are sometimes interbedded with the loess. Some of the loess, how much was not determined, had an æolian origin.

ROLLIN D. SALISBURY.

RECENT ZOOPALEONTOLOGY.

A FOSSIL CAMEL FROM SOUTHERN RUSSIA.

PROFESSOR NEHRING,* of Berlin, describes the skull of a Pleistocene camel from beds along the Volga, in the same state of preservation as the mammoth, wild horse, reindeer and *Elasmotherium*. From the distribution of this and other Pleistocene camels in Roumania and Algiers, the author agrees with the view expressed by Lehmann (1891) that the dromedary and Bactrian camel originated in two distinct regions, the former being a *subtropical* steppe and desert animal, the latter belonging to the *subarctic* steppes and deserts.

FOSSIL REMAINS OF LAKE CALLABONA.

E. C. STIRLING,† director of the South Australian Museum, opens a series of memoirs on the large deposit of fossil bones discovered in the bed of Lake Callabona, South Australia, first reported in *Nature* in 1894. The present memoir is devoted to the manus and pes of *Diprotodon*, the largest and most abundant marsupial in this remarkable deposit. The salt clay in which the bones were embedded was always wet, the necessary excavations soon filling with water. Nevertheless fourteen feet were removed *en masse* within large balls of the matrix clay. Besides the great difficulties of removal the fossils had to be carried two hundred miles to a railway station, by camel

* 'Ein fossiles Kamel aus Südrufsland, nebst Bemerkungen über die Heimat der Kamele,' *Sonderabdr. aus dem Globus*, Bd. LXXX., Nr. 12, pp. 188–189.

† 'Fossil Remains of Lake Callabona,' Part I. *Mem. Roy. Soc. S. Australia*, Vol. I., Part I., pp. 1–40, Pl. I.–XVIII., 4to. Adelaide, 1899.

transport. The limbs evidently rested chiefly on the carpals and tarsals, the phalanges and metapodials being extraordinarily reduced with the exception of the metatarsal of the fifth digit. The feet as a whole are comparable to those of the wombats, there being evidences of syndactylism and reduction in the second and third digits. A limb of *Genyornis*, the great struthious bird from this deposit, has recently been sent to the American Museum.

TRANSFERENCE OF SECONDARY SEXUAL CHARACTERS FROM MALES TO FEMALES.

In this brief but important paper, Dr. C. I. Forsyth-Major* reviews Darwin's statement in the 'Descent of Man,' as to the probability that horns of all kinds, and canine tusks even when they are equally developed in the two sexes, were *primarily* acquired by the male in order to conquer other males and have been transferred more or less completely to the female. Darwin's inference did not rest upon paleontological evidence, and Dr. Major therefore reviews the evolution of the families of Cervidæ, Giraffidæ, Bovidæ and Suidæ, with the general conclusion that Darwin's inference was correct. He concludes with the remark, "In our own species the modern aspirations of women are to all appearances incipient signs of the same natural law. Physical and mental characters of man, originally acquired in the struggles of the males, are apparently being slowly transferred to women. They only require time for their full evolution."

HOMO NEANDERTHALENSIS A DISTINCT SPECIES.

Professor G. Schwalbe† publishes in the proceedings of the *Anatomische Gesellschaft* an exhaustive study of the famous Neanderthal skull, which he concludes as follows:‡ "I believe I have shown that the Neanderthal skull is distinguished by no small number of characters which in many respects bring it much nearer that of the anthropoid apes than that of man. I therefore regard the position of King and of Cope in designating this as a type of a distinct species as entirely justified. I follow in this respect the modern practice of zoologists and paleontologists. This species is by no means to be included with the Paleolithic or Quaternary man; it is an older form, which is to be compared only with the skull of Spy, and the lower jaw found at Naulette. Very probably these skulls belong to the lowest diluvium, lying near the limits of the Tertiary, although the possibility must be admitted that *H. Neanderthalensis* may represent a persistent lower race contemporary with the newer Pleistocene *Homo sapiens*."

DISTINCTIONS BETWEEN THE SKULLS OF LEMURS AND MONKEYS.

Dr. C. I. Forsyth-Major,* of the British Museum, has recently been comparing in a most exhaustive and critical manner the facial region of the lemurs and monkeys, and has especially shown that the commonly accepted view of the exposure of the lachrymal bone upon the face as a primitive character is probably erroneous. This has been one of the most frequently employed distinctions between lemurs and monkeys. He proves that, on the contrary, even in the supposedly ancestral Insectivora an exposed lachrymal and lachrymal canal are not a common character. In the fossil lemurs, *Adapis* shows the lachrymal bone and duct within the orbit. Among existing types the lachrymal is scarcely more frequent in the lemurs than in the higher groups, and the greatest known reduction of this bone occurs within the lemurs. The author's conclusion is that a great facial expansion of the lachrymal, and particularly its extension beyond the fossa lachrymalis is, in the lemurs, as well as in the monkeys, not a primitive condition, but an extreme specialization; it can always be traced back to an elongation of the facial cranium necessitated by a more powerful dentition. In the reviewer's opinions each elongation is not secondary but primitive.

* *Geol. Mag.*, Dec. IV., Vol. VIII., 1901, pp. 241–245.

† 'Ueber die specifischen Merkmale des Neanderthalschädels,' *Verh. der Anat. Ges.*, XV. versamml. in Bonn., 26–29 Mai, 1901, pp. 44–61, 8vo. Jena.

‡ Translation and abstract.

* 'On some Characters of the Skull in the Lemurs and Monkeys,' *Proc. Zool. Soc.*, Feb. 19, 1901, pp. 129–153, Pl. XI.–XIII.

DISTINCT PHYLA OF RHINOCEROSES.

IN 1900 Osborn attempted to demonstrate that the rhinoceroses, so far from being included in a single genus, should be separated into at least six lines of descent, which have been distinct for so long a period that they are almost entitled to subfamily value, extending back to the Lower Miocene and even probably into the Oligocene. Oldfield Thomas and R. Lydekker, of the British Museum, have recently accepted this conclusion in the main, and the former* proposes to divide the living types into three genera, namely, *Rhinoceros*, the Indian forms *(R. unicornis, R. sondaicus)*, *Dicerorhinus* Gloger, the two-horned Sumatran types (Thomas points out that this name has the priority over *Ceratorhinus* Gray), and *Diceros* Gray for the African two-horned species (this name taking precedence over *Atelodus* Pomel). It is pointed out that Osborn was in error in describing the smaller African rhinoceros *(D. bicornis)* as dolichocephalic since its head is much shorter than that of *D. simus*, the white rhinoceros. Professor A. Nehring, of Berlin, also dwells in a recent paper upon the extraordinary dolichocephaly of the white rhinoceros, showing that the skull surpasses in length even the longest recorded skull of the woolly rhinoceros (*D. tichorhinus*).

H. F. O.

THE BOTANICAL SECTION OF THE CONCILIUM BIBLIOGRAPHICUM IN ZÜRICH.

FOR some years past the increasing success of the Concilium Bibliographicum in the zoological part of its work induced a number of botanists to urge this institute to undertake a botanical bibliography on similar lines to those followed in zoology. Such a course was also recommended by the chief of the Swiss 'Department of Interior' in awarding the government subsidy to the work. Such wishes have always found a sympathetic echo with the committee in charge of the Concilium, as well as with the founder of the Institution. It seemed, however, unwise to extend the enterprise to other branches, until the finances had become quite satisfactory. For this reason, no public statement of our intention in this regard has been made, save such general allusions as are to be found, for example, in the presidential address to the Botanical Section of the American Association meeting in 1900.

Recently, however, the committee of the new 'Association Internationale des Botanistes' has offered us means for organizing such a section of the Concilium without involving the latter in financial liabilities greater than it could with safety assume. The negotiations which were begun by telegraph late in January have been carried on with great rapidity, and we are now able to announce the organization of a botanical section comprising two energetic Zürich botanists, Dr. Stephan Bruneis and Mr. Emil Schoch-Etzensperger. For the year 1902 it is of course out of the question to issue a card catalogue. The year will be spent in preparation, so that the difficulties encountered in the first two years of the zoological card bibliography may be entirely avoided. Also no attempt will yet be made to record new species and genera, as is done in zoology. For the present merely the well-known bibliography of the *Centralblatt* will be continued, with certain minor improvements. The main object of this announcement is to make a direct personal appeal to all those who publish botanical papers, urging them to send copies to the *Concilium Bibliographicum, Zürich-Neumünster, Switzerland.* It is particularly important that this appeal should be brought home to editors and publishers of periodicals containing botanical notices; for the journals are far easier to excerpt than authors' reprints. Journals already reaching a Zürich library need not be sent; but we hope that all botanists will assure themselves of this fact before assuming that their collaboration in the matter of securing a given publication is unnecessary. The response that zoologists in America have given to our former appeals justifies the hope that their botanical brethren will show similar public spirit.

HERBERT HAVILAND FIELD.

ZÜRICH.

* 'Notes on the Type Specimen of *Rhinoceros lasiotis* Scalter; with Remarks on the Generic Position of the Living Species of Rhinoceros.' *Proc. Zool. Soc.*, June 4, 1901, pp. 154–158.

SCIENTIFIC NOTES AND NEWS.

The twenty-fifth anniversary of the founding of the Johns Hopkins University and the inauguration of Dr. Remsen as president of the university were celebrated at Baltimore on February 21 and 22. The commemorative address of Dr. D. C. Gilman, for twenty-five years president of the university, and now president emeritus and president of the Carnegie Institution, and the inaugural address of President Remsen are published above, as is also the list of those on whom honorary degrees were conferred. The assembly of eminent educators, scientific men and others at the exercises was one of the most notable that has gathered in America. One of the most interesting events was the presentation to Dr. Gilman of an address signed by over 1,000 alumni and others who are or have been connected with the university.

The University of Pennsylvania has conferred the Doctorate of Laws on Professor Wolcott Gibbs.

At the annual general meeting of the Royal Astronomical Society on February 14, the Society's gold medal was presented to Professor J. C. Kapteyn, of Gröningen, Holland, for his work in connection with the Cape Photographic Durchmusterung, and his researches on stellar distribution and parallax. The Jackson-Gwilt (bronze) medal and gift was presented to the Rev. Thomas D. Anderson, of Edinburgh, for his discovery of Nova Aurigæ and Nova Persei.

Dr. T. J. J. See, U. S. Naval Observatory, has been elected to membership in the Deutsche Mathematiker-Vereinigung, and to the Société Mathématique de France.

Dr. Ernst von Bergmann, professor of surgery at Berlin, was given the title of privy councillor on the Emperor's birthday.

Professor Max Gruber, of the University of Vienna, gave the Harben Lectures before the Royal Institute of Public Health in January, the subject being 'Bacteriolysis and Hemolysis.'

Mr. William Marconi sailed for Canada on February 22 to continue his trans-atlantic experiments in wireless telegraphy.

Mr. C. E. Borchgrevink, the antarctic explorer, is at present lecturing in the United States.

Professor Duclaux, director of the Pasteur Institute, Paris, suffered recently an attack of hemiplegia. After lying in a critical condition for a number of days, he is now improving.

The papers note that a marble statue of Professor Ernst Haeckel is being made by the sculptor Harro Magnussen.

Mr. John Ackhurst, a taxidermist residing in Brooklyn, died on February 15 at the age of eighty-six years.

Dr. E. Selenka, professor of zoology at Munich, died on January 20, at the age of sixty years.

There will be a civil service examination on April 2 for the positions of plant pathologist, chemist, physiological chemist and analytical chemist in the Philippine service. The salaries of these positions are from $1,500 to $2,000. There will also be filled by civil service examination on the same day the position of agrostological clerk in the Bureau of Plant Industry at a salary of $720.

Mrs. George Whitfield Collett has contributed $5,000 to the endowment fund of the New York Botanical Garden, in memory of the late Josiah M. Fiske.

The laboratory for the investigation of cancer in Buffalo has been removed into the building donated through the generosity of Mrs. Gratwick.

Professor B. Tirusch has bequeathed to the Museum of Natural History at Prague his library and estate, valued at $25,000. He had previously given numerous specimens to the zoological, botanical and geological sections of the Museum.

Mr. Deboe, of Kentucky, has introduced a bill in the Senate to establish a university of the United States. It provides that the grounds set aside by Washington for a university, lately occupied by the U. S. Naval Observatory, are to used as the site.

THE Minnesota Seaside Station party of 1902 plans to leave Minneapolis on July 12, at the close of the meeting of the National Educational Association. It will proceed via the Canadian Pacific Railway to Vancouver, thence by steamer to Victoria and finally to Port Renfrew by coasting vessel. The party will return to Minneapolis about September 1, giving a month or more by the sea and ample time for stops in the Rockies and Selkirks, arrangements for which have been made with the railway. The following staff is expected to organize the work of instruction and, as far as necessary, research, during the term of station activity: Professor Conway MacMillan, M.A., director-in-chief and lecturer on algology (Phæophyceæ); Professor Raymond Osburn, M.S., professor of zoology; Professor K. Yendo (Rigakushi), professor of algology (Rhodophyceæ); Miss Josephine E. Tilden, M.S., professor of algology (Chlorophyceæ and Cyanophyceæ).

THE annual report of Will. C. Ferrill, curator, State Historical and Natural History Society, Denver, Colorado, shows the following record for the past year. The additions to the library and historical collections were 1,159, and to the scientific collections, 3,425 specimens, making a total for the year of 4,584. This Society, which is both historical and scientific in its scope, now occupies fourteen rooms in the state house, and its museum was visited during the past year by 156,148 people. A valuable addition to the museum during the year was the Horace G. Smith Arapahoe County collection of about 650 birds, obtained in the vicinity of Denver. These, together with Colorado specimens obtained by Curator Ferril in field work, added to an older collection, now give the department of ornithology about 2,500 specimens of Colorado birds.

IT should have been stated in the issue of SCIENCE for February 14, page 269, that the original journals of Lewis and Clark will be published under the auspices of the American Philosophical Society.

A WRITER in the New York *Sun* states that the strange giant cactus, *Cereus giganteus,* is being exterminated by irrigation, and that many years will not elapse before extinction has taken place. This is probably an extreme view of the case, for there must be many localities, comprising vast areas of land, where irrigation will not only not be attempted, but be impossible, and here the weird-looking plant may hold its own. The species attains a height of sixty feet and, contrary to popular belief, is short lived. Moisture is fatal to it and as soon as it receives a constant supply rapid decay sets in and destroys the plant.

AFTER being cut off from communication with the outside world for two and a half years in hitherto unexplored parts of mid-Asia, Dr. Sven Hedin, the Swedish explorer, reached India towards the close of December. In an outline of his expedition the London *Times* says that reaching Andijan by the Transcaspian Railway in the middle of 1899, he traveled to Kashgar on horseback, and from thence sailed down the river Tarim, or Yarkunddarja, to Lob Nor, in the heart of Eastern, or Chinese, Turkestan. Making this place on the shores of the lake of the same name his headquarters, he took excursions of varying length through the Gobi Desert and over the great range of the Shian Shan mountains. Out of the 6,000 miles thus traveled only some 500 miles were along the tracks of earlier wanderers, all the rest having been unexplored. He discovered a series of ruined cities of Chinese and Mongolian origin, about 800 years old, and found in them some extraordinary sculptures and some ancient manuscripts of an extremely rare description. These cities would, he said, throw an altogether new light on questions affecting the distribution of the various human races and the migratory movements of Asiatic peoples. He went through the whole of the northern and central parts and a portion of Eastern Tibet, and through the great Gobi Desert in Western China. His last and most prolonged journey was right across Tibet, first from north to south and then from south to west. He proposed to publish three 'rather ponderous tomes of a scientific nature,' but he would first compile a large book for popular reading giving a description of his travels. He had taken over 4,000 photographs and numerous sketches. In scientific results this

was far and away the most important journey he had ever made, and he expressed his gratitude to King Oscar, and to some friends interested in scientific research for placing the means at his disposal for the journey.

The Geographical Journal states that it has lately been announced that an expedition, under the command of Lieutenant Héron, and including several other officers on its staff, was to leave Marseilles for Indo-China on January 12. Its object is to complete our knowledge of the coasts of Indo-China by accurate surveys, and to study the distribution of terrestrial magnetism in that region, besides carrying out general investigations in matters relating to hydrography and navigation. It sails under the orders of the Minister of Marine.

UNIVERSITY AND EDUCATIONAL NEWS.

THE gift of Mr. John D. Rockefeller to the Harvard Medical School of $1,000,000 was conditional on $765,000 being collected to meet the sum required for the removal and rebuilding of the school. Of this sum about $600,000 has been subscribed in two weeks.

THE executors of the will of the late Jonas D. Clark have agreed to transfer $800,000 to Clark University for the establishment of a collegiate department.

BUCHTEL COLLEGE at Akron, Ohio, has received an unconditional gift of $20,000.

THE directors of the Pennsylvania Railroad have given $5,000 to the fund for the rebuilding of the University of Wooster, destroyed by fire on December 11.

A BILL is now before the New York Legislature, appropriating $200,000 for new buildings for the College of Agriculture at Cornell University.

THE State Department has notified President Butler, of Columbia University, of the receipt of a despatch from Minister Conger at Pekin, which gives full information regarding the gift of books and other material to illustrate the instruction in Chinese subjects to be undertaken under the new Dean Lung or Charpentier foundation at the University. The collection selected by the Foreign Office of China for presentation to Columbia is known as the T'u Shu Chi Ch'eng, a standard collection of ancient and modern works. It is the most comprehensive ever made in China and consists of more than 6,000 volumes, divided into thirty-two classes in which all facts regarding China are recorded and classified, all sources of information and all authorities cited and discussed.

IT is announced that hereafter students of the medical school of Yale University may complete the course in three years if they elect the necessary preliminary studies in the academic department.

DR. CHAS. H. JUDD, professor of psychology in the University of Cincinnati, has received a call to Yale University.

DR. J. W. MOORE, professor of physics, has been appointed dean of the Pardee Scientific Department of Lafayette College, succeeding the late Dr. T. C. Porter.

DR. W. F. SNOW has been made acting-head of the department of hygiene at Stanford University.

MR. S. E. BRASEFIELD has been appointed instructor in civil engineering in Lafayette College.

THE Universities of St. Petersburg, Kieff and Kharkoff have been closed, owing to the difficulties between the students and the authorities.

THE Government has dismissed all the European professors at the Imperial University of Pekin, and Dr. Martin, the president, has been offered a subordinate position.

MR. F. T. TRONTON, M.A., F.R.S., has been appointed to the Quain chair of physics in University College, London.

MR. FREDERICK PURSER, fellow of the College, has been elected to the chair of natural philosophy in Trinity College, Dublin, lately vacated by Dr. Tarleton.

MR. GEORGE REYNOLDS, M.A., F.R.S., professor of engineering in the Owens College, Manchester, has been appointed to the office of Rede Lecturer at Cambridge University for the present year.